JANUARY 1959

Agricultural Engineering

The Journal of the American Society of Agricultural Engineers

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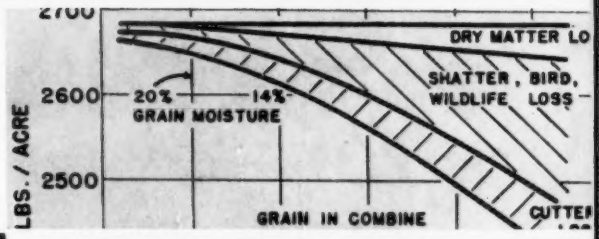
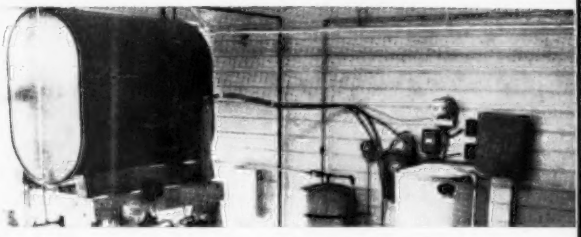
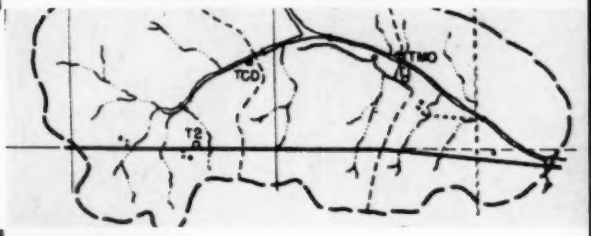
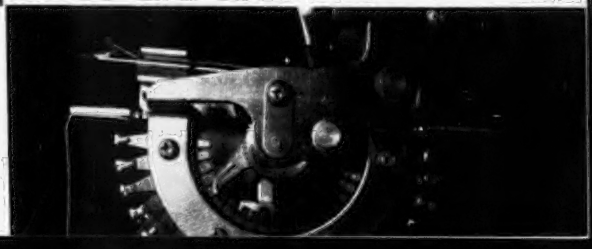








CASE HISTORIES

N/D double row ball bearings maintain maximum axial and radial rigidity and resist extremely heavy misaligning forces encountered in backhoe applications.

Photo: Courtesy Ottawa Steel Division, Young Spring & Wire Corp.

N/D Ball Bearings Reduce Friction... Up Usable Hydraulic Power In Backhoe!

CUSTOMER PROBLEM:

Increase efficiency of tractor/truck-mounted backhoe and reduce in-the-field maintenance requirements for the end customer.

SOLUTION:

N/D Sales Engineer, working with the manufacturer, recommended replacing 10 bronze bushings with factory lubricated New Departure shielded ball bearings. These New Departures eliminated arm play and loose joints . . . reduced friction to make more, useful hydraulic power available! What's more, shielded N/D ball bearings resist wear. They eliminated the need for relubrication maintenance because they're lubricated for life!

If you're working on new equipment designs, or redesigning, why not call on New Departure? New Departure's wide selection of construction and farm equipment ball bearings means there's probably a production bearing that will help you. For more information, write Department E-1.

Available through United Motors System and its Independent Bearing Distributors.

NEW DEPARTURE

DIVISION OF GENERAL MOTORS, BRISTOL, CONN.

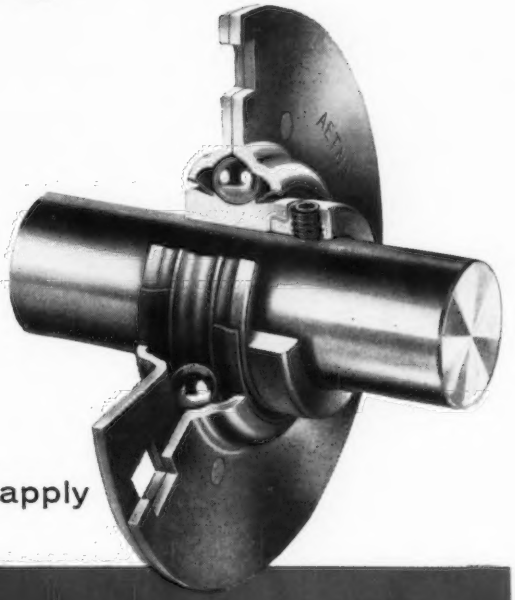
NOTHING ROLLS LIKE A BALL

NOW... more manufacturers can afford to put more ball bearing efficiency to work in more places

Aetna

ADAPTER BEARING

Economical to buy . . . economical to apply



Equipment manufacturers who must stretch bearing dollars in order to build to a price need look no further than this Aetna Adapter bearing —the completely *PACKAGED* ball bearing unit that brings low-cost, anti-friction efficiency within the range of all light-duty slow-speed equipment.

Designed and built-to-be-installed-and-forgotten, this permanently lubricated, sealed-for-life Adapter bearing requires no re-lubrication, no maintenance of any kind. It combines self-aligning bearing, seals, mounting flange and locking collar in a single, compact, factory-assembled *PACKAGE* that mounts easily, quickly, wherever shafts can be supported, including mounting on sheet metal or any semi-rigid structural member. Available in 8 standard shaft sizes, ½" to 1¼". Send for catalog AG-57 or call in the local Aetna representative listed in the yellow pages. Aetna Ball & Roller Bearing Co., Division of Parkersburg-Aetna Corp., 4600 Schubert Ave., Chicago 39, Ill.

EASY, QUICK 3-STEP MOUNTING

1

Drill (or punch) 3 bolt holes in shaft supporting member.

2

Place Adapter bearing in position, insert bolts and tighten nuts.

3

Install shaft, twist locking collar, tighten set screw.

Aetna

ANTI-FRICTION CONSULTANT TO LEADING ORIGINAL EQUIPMENT MANUFACTURERS SINCE 1916

Agricultural Engineering

Established 1920

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National Electrical Week

THE 1959 National Electrical Week will be celebrated February 8 to 14. The all electrical industry event, which marks the birth of Thomas Alva Edison, is held each year during the week of February 11 to focus attention on the contributions of electricity.

For the second consecutive year National Electrical Week activities will be coordinated with those of Science Youth Day which has been observed to interest more junior and senior high school students in science and engineering careers; and to stimulate greater interest in effective science education and wider public acquaintance with science and technology.

Approximately 150,000 junior and senior high school students will be invited to tour laboratories and company plants throughout the United States, Hawaii and Canada. All programs will allow time for informal discussions between scientists and students.

"Electricity Builds Jobs" will be the central theme of National Electrical Week, as revealed by N. J. MacDonald, president of the Thomas & Betts Co., Elizabeth, N. J., and general chairman of N. E. W. Committee. He states that the week will be an "umbrella activity" for all branches of the electrical industry, providing a springboard for the various educational, public relations, and promotion goals of the industry, and at the same time focusing attention on the contributions of electricity and the electrical industry to our American economy.

Special Science Youth Day booklets as well as buttons are available to companies that want to participate in the activities. Both may be obtained by writing to Harry L. Cherry, Jr., Secretary International Edison Birthday Celebration, Suite 806 — 8 West 40th St., New York 18, N. Y.

Strong support has been given to the event by major companies and corporations through radio, television, magazines, newspapers, company publications and through special educational and promotional programs.

A special color advertisement featuring National Electrical Week in *Time, U. S. News* and *World Report, Newsweek, Business Week, Fortune,* and the *Wall Street Journal* will be run by one manufacturing company. Another company plans to feature N. E. W. by asking all dealers to use the N. E. W. slogan in advertising from January 15 to February 14. This company is sending 1959 N. E. W. planning guides to all districts and all the company's correspondence will feature N. E. W. on the stationery. Locally developed N. E. W. programs in an appliance company's more than 100 decentralized product departments across the nation will include local radio and television messages, presentations of Edison lamp replicas to city and state officials, community speaking engagements by plant officials, plant tours for community neighbors, essay contests for school children, window displays and reception room exhibits of electrical interest, N. E. W. editorials and features in plant newspapers, posters on company trucks, use of the N. E. W. symbol on postage slugs, and use of the symbol in the company's product advertising wherever possible.

The National Electrical Week is sponsored by nine leading trade associations and professional societies and is endorsed by 15 others, including the American Society of Agricultural Engineers.

CASE® Engineers Develop

New Spreader Conveyor Mechanism

...to Utilize V-Belt Drive

New Case 5-pawl ratchet conveyor drive consists of a ratchet gear and sprocket fixed together, floating freely on needle bearings around an eccentric that is fixed to the lower beater shaft. The eccentric imparts a rotational oscillation to the ratchet gear. Spring-loaded pawls on fixed pivots are located around the periphery of the ratchet. Engaging the second pawl gives rotational movement of one ratchet tooth per revolution of the eccentric . . . 3 pawls engaged give 2 teeth, and so on until 5 pawls give the 4th feed of 4 ratchet teeth. Since the only reciprocating part is a small chain tightener, the drive lends itself very successfully to high speeds.

PROBLEM

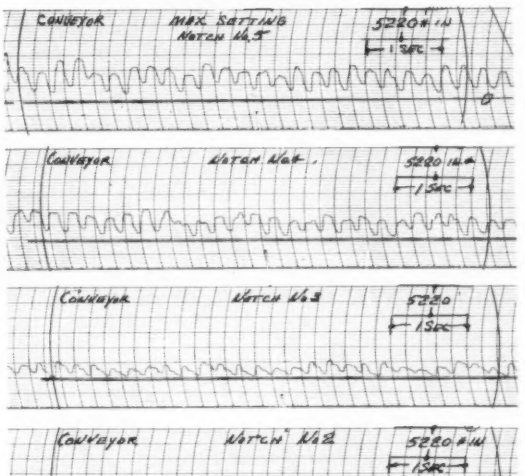
In considering the application of V-belt power to manure spreaders, Case engineers found that peak stresses and shock loads on beater and conveyor would increase dangerously high, if the traditional ratchet-type conveyor mechanism was retained. For the sake of both durability and efficiency they had to reduce the number and weight of reciprocating masses, avoid hammering action and smooth the intermittent conveyor motion. *Yet they could not abandon the basic ratchet drive entirely because of manufacturing costs.*

SOLUTION

Case engineers replaced the linear, uni-directional driving arms of the old-style ratchet drive with several driving members exerting forces in a number of radial directions. This gave uninterrupted rotation to the driven component. In addition, the driver part was given circular motion rather than linear, thus eliminating stopping and starting.

RESULT

The result is the 5-pawl ratchet drive described above. It has a very uniform acceleration curve with only a slight pause in all feeding rates (see graph at right) . . . makes possible the smoothest-operating manure spreader on the market. The new Case V-belt spreader unloads in 70.5 per cent less time than conventional spreaders, with horsepower requirement increased only slightly.



The graph lines above show the torque characteristics of the new Case 5-pawl Ripl-Glide conveyor drive in each of its four feeding rates.

Modern engineering for modern farming is more than just a phrase at Case . . . it is a philosophy . . . a perpetual dissatisfaction with old, outworn concepts . . . a constant seeking of new concepts in power farming—of new approaches to the basic farm problem of producing more for less.

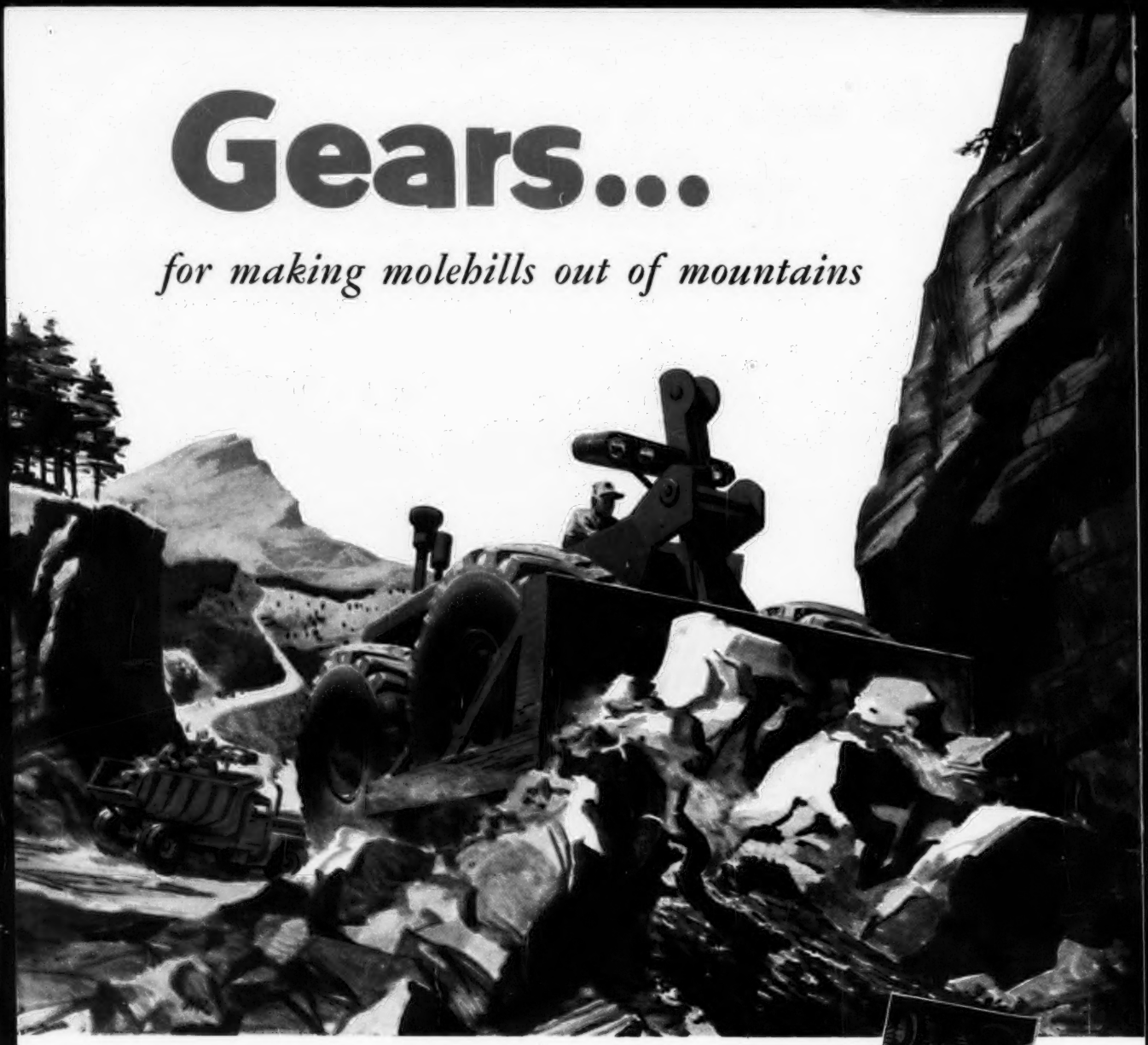
J. I. CASE

J. I. CASE CO. • RACINE, WIS.

1st in Quality for Over 100 Years

Gears...

for making molehills out of mountains



It is hard to imagine worse working conditions, and that is the very reason why the manufacturers of so many kinds of road building equipment install "Double Diamond" gears. Wherever the going is especially rough, wherever gears must give uninterrupted service on harsh, time-table schedules, you'll find our gears at work.

For low installed cost, for true operating economy and performance, and for buckling down to the hardest kind of service—nothing beats "Double Diamond."

Our salesmen are experienced gear engineers. Why not talk to one about your gear requirements?

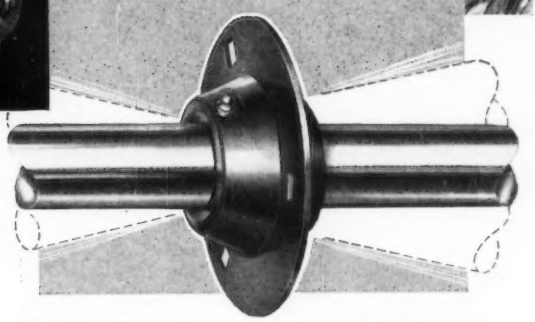
May we send you a copy of this comprehensive catalog on the many gear types in which we specialize?

EATON

AUTOMOTIVE GEAR DIVISION
MANUFACTURING COMPANY
RICHMOND, INDIANA

GEARS FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

Adjusts to axial misalignment —when going is rough



ROLLWAY FLEXI-FLANGE® BEARING

with neoprene housing and Buna seal

A rugged unit of versatile application, the Rollway Flexi-Flange readily adjusts to angular shaft displacements caused by rough terrain. Engineered to the service demands, life-expectancy and storage requirements of most implements, the cost is well within the salable limits of implement pricing.

Flexible Neoprene Housing

Permanently bonded to the flange, the flexible neoprene housing permits wide-angle shaft displacement and assures bearing parallelism under all conditions of load and stress. Life of the long-line rollers and races is surprisingly lengthened by this design. There is a corresponding reduction of fatigue on the shaft on which the rollers operate.

Resists Oil, Grease, Heat and Cold

Exhaustive tests and field usage have conclusively proved the durability of the neoprene housing and Buna seal. It retains its life and resilience after long use and repeated exposure to oil, grease and extremes of heat and cold.

Easy to Install

The self-contained Flexi-Flange unit is easily installed . . . saves assembly time . . . lasts for the normal life of your implement.

WRITE or wire for descriptive bulletin or free engineering consultation on your application problems.

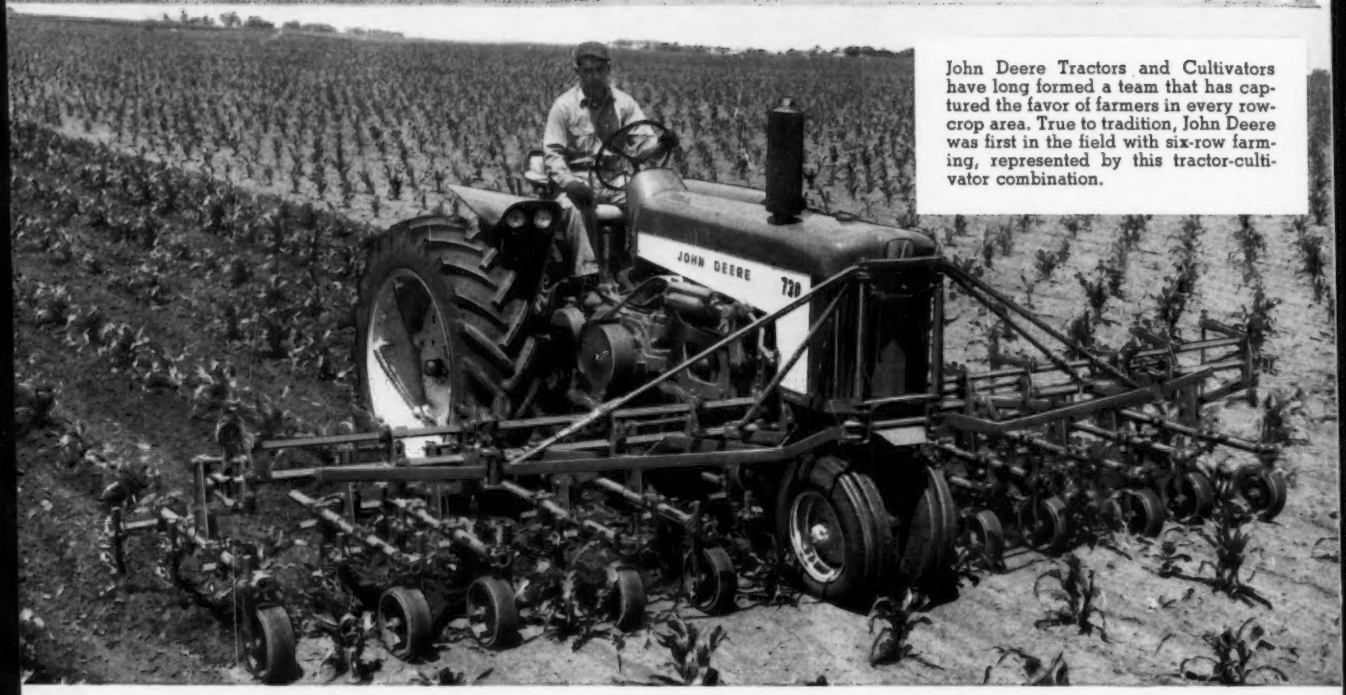
ROLLWAY BEARINGS

ROLLWAY BEARING CO., INC. 541 SEYMOUR STREET, SYRACUSE 1, N.Y.

ENGINEERING OFFICES

SYRACUSE, BOSTON, CHICAGO, DETROIT, TORONTO, PITTSBURGH, CLEVELAND, SEATTLE, HOUSTON, PHILADELPHIA, LOS ANGELES, SAN FRANCISCO

RIDING THE CREST OF the Most Salable



John Deere Tractors and Cultivators have long formed a team that has captured the favor of farmers in every row-crop area. True to tradition, John Deere was first in the field with six-row farming, represented by this tractor-cultivator combination.

That's the big story in the farm equipment industry today—the unmatched high in farmer acceptance enjoyed by the John Deere line of tractors and implements.

A Many Sided Story . . .

It's a story of quality. It's a story of anticipation of the farmer's needs and a determination to meet them. It's a story of far-sighted design, of painstaking engineering, and skillful production . . . all part of the price of leadership and all dedicated to the end of providing the modern farmer with new labor-saving, profit-making equipment, and of constantly improving existing equipment.

And There's More . . .

But it's more than that. It's a story of sound merchandising, advertising, and credit provisions—the kind of program that enables the John Deere dealer to serve his customers in the best possible way and to harvest the benefits in good will and repeated sales.

John Deere Combines swell grain harvests.

John Deere Grain Drills—leaders for generations.

farmer acceptance...

Line in the Farm Equipment Field

John Deere Equipment sets the pace in better haymaking.

John Deere Picker-Sheller—champ of the Corn Belt.

ohn Deere Cotton Pickers have won the South.

A year-round, never-ending program of research and tests is carried on in the modern Research and Engineering Center at Waterloo, Iowa, at several all-weather proving grounds, and in all John Deere plant cities. In such centers John Deere engineering and development pursue the goal of ever higher manufacturing quality.

The important role played by such research and engineering centers is another important item in making the John Deere dealer franchise the most valued in its field.

Modern John Deere Planters are famed for accuracy.

John Deere Disk Harrows set a pattern for profit.

John Deere Plows, traditional favorites.

JOHN DEERE
MOLINE, ILLINOIS

JOHN DEERE

Pictured here are only a few of the many tractors and implements which are recognized leaders and which have made the John Deere Trademark a symbol of unmatched farmer acceptance.

"WHEREVER CROPS GROW, THERE'S A GROWING DEMAND FOR JOHN DEERE FARM EQUIPMENT"

Report to Readers . . .

SCIENTISTS VISUALIZE NUCLEAR REACTOR TO DESTROY CROP PESTS

Two UCLA nuclear scientists report they have developed the basic plans for a mobile nuclear reactor specially designed for destroying various crop pests, including parasites, insects and weeds. The main use for such a reactor would be the application of gamma rays and neutrons for sterilizing the soil and ridding it of the several billions of nematodes per acre that infest it. . . . . Admittedly research, design and development of a portable reactor would be exceedingly expensive, but by amortizing the cost over a period of a few years, the researchers say it could be greatly scaled down. . . . . These scientists also believe that use of the portable reactor might even make crop rotation an obsolete practice. They point to the fact that there is abundant evidence that sterilized soil produces healthier plants, which in turn produce larger yields than plants in soils that have been merely fertilized. . . . . As to possible dangerous effects of radiation on the crops and on the humans and animals that consume them, the sterilizing of the soil would be done before planting and would only be residual and negligible in strength by seeding time. The crops would therefore have little if any radiation carry-over.

POTATO DIGGER MADE TO DOUBLE AS STONE PICKER

Huge piles of field stone and miles of stone fence have long been familiar sights on farms of northeast USA. Most of the stone had to be removed from valuable cropland by hand labor, which even at earlier day wage rates was difficult to justify. . . . . It was natural, therefore, that the coming of the machine age to agriculture should give many a mechanically minded individual an urge to develop a practical mechanical stone picker. Many have attempted it, and with some measure of success, but none of the machines produced has ever seemed to really get off the ground as a commercial success. Why? No doubt largely because of their cost. . . . . Now what appears to us as a really big step in the direction of solving this age-old problem of field-stone removal has just been announced by a farm equipment manufacturer, who has adapted one of their two-row model potato diggers to the purpose. Company engineers designed a stone-picker attachment for the digger consisting of a power-driven cross-elevator at the rear of the digger which carries the stones up into a truck driven alongside. . . . . The digger operates about 6 inches deep and clears a strip 65 inches wide with a single blade. In fields that are heavily infested, it is claimed this combination has removed up to 350 tons of stones in a single day. It will handle stones ranging from 1½ to 8 inches in diameter. The stone-picker attachment is readily removable for regular use of the machine as a potato harvester.

LIQUID-MANURE DISPOSAL SYSTEM DEVELOPED FOR HOG PRODUCTION

Finishing market hogs in confinement may well become a fast-growing development. Also, it is certain to present some good engineering problems, one of which is manure disposal, a subject discussed by a University of Illinois agricultural engineer at an ASAE meeting last month. . . . . This engineer finds hand scraping followed by water rinsing to be an efficient method of cleaning the concrete floors of finishing pens. On one farm in Illinois this method requires about 20 minutes a day for 200 hogs, or 6 seconds per hog. . . . . The manure-water mixture is accumulated in underground storage tanks, from which it is pumped – in some cases by 4-inch grain augers – into tank wagons for hauling and spreading on the land. . . . . This operation is of interest also in that converting the manure to liquid form proved to be a good solution to a difficult materials-handling problem, and one that, according to the engineer reporting it, promises to gain popularity.

INTEREST AT PEAK IN HAY PELLETING AND WAFERING

There can be no doubt of the keen, nation-wide interest in forage pelleting and wafering – and this interest continues to mount. Last month at the ASAE winter meeting a jam-packed evening audience of agricultural engineers discussed at length the engineering development implications of the subject. Besides the

(Continued on page 10)

BCA ball bearings

low-cost "package units" save time in the factory, trouble in the field

BCA "package units" simplify production line installation . . . reduce manufacturing costs. Bearing, housing and seal are combined in a single, rugged unit. Each is lubricated for life and effectively sealed against water, dust and grit. Maintenance in the field is reduced . . . performance is unsurpassed. BCA "package units" are built to withstand loads, speeds and operating conditions encountered in any type of agricultural work. The "package units" illustrated are four of the many available.

HAY RAKE BEARINGS

Patented design provides for triple barrier against entrance of contaminants. Misalignment of tine bar can be compensated for without detrimental effect to bearing. Shank length, diameter, and thread can be varied to fit specific requirements.

IDLER PULLEY ASSEMBLIES

Pulley, bearing, and seal—all in one complete package unit. Adaptable to many agricultural applications, including: combines, forage harvesters, corn pickers, hay balers, grain elevators, cotton pickers. Idler design can be varied for use with flat belts, V-belts or chains.

CLUTCH BEARINGS

Exceed engineers' most severe test standards . . . over 70,000 declutchings at speeds corresponding to more than 60 M.P.H. BCA construction features: high carbon chrome balls; carburized and precision ground steel washers; single piece V-section retainer to trap grease between rotating members; labyrinth sealed with rigid pressed steel housing and special bronze ferrule, packed with a stable, high-temperature grease.

PLUNGER ROLLERS

Built with a thick-sectioned outer ring, hardened throughout, these package units are specially adapted for sliding heavy masses on rails. Principal application is in hay baler plungers, replacing plastic and metal liners, and ending the problem of wear and constant replacement. Bearings come in two types: for flat tracks, and for V-shaped tracks.

BCA

BEARINGS COMPANY OF AMERICA
DIVISION OF
Federal-Mogul-Bower Bearings, Inc.

engineers, farmers the country over are likewise intensely interested; in fact, Doane Agricultural Service recently stated that, based on its study, there exists a potential market for 175,000 field hay-pelleting machines over the next five years. One of the Doane staffers states that, although pelleting forage for livestock is still quite new, it is one of the "hottest" and fastest growing developments in agriculture. . . . . At present two different developments are taking place: one is the pelleting of high-roughage, complete rations with conventional, stationary pelleting equipment; the other, and newer, development involves the pelleting or "wafering" of hay with mobile equipment right in the field. The latter is the newer form, and it is not yet possible to know how it will affect feeding results.

NEW MOWERS PROVE CAPABLE OF MOWING UP TO 50 ACRES A DAY

The early mowing machines, developed by American manufacturers, served their purpose quite well, so long as they were drawn by animals. However, as a direct result of adapting the tractor and the power take-off to mower operation, great improvements have come about in mower design and performance. . . . . In one new mower, for example, a wrist-action sickle drive, which replaces the pitman, controls vibration, thereby permitting the machine to operate at a much higher speed. The sickle drive, which has an accurate counterbalance, always travels in an opposite direction to that of the knife, and this permits only enough vibration to clean the cutter bar properly. . . . . The balanced-head drive of this mower works parallel with the cutting action of the knife, even as the cutter bar lifts or drops to follow the contour of the ground. This makes clean cutting possible, even with the cutter bar at extreme angles, with the knife register unaffected by the position of the cutter bar above or below the level of the mower wheels. This mower is designed for use with two plow or larger tractors equipped with power take-off and hydraulic controls, and the manufacturer says it is capable of mowing 50 acres a day under favorable conditions.

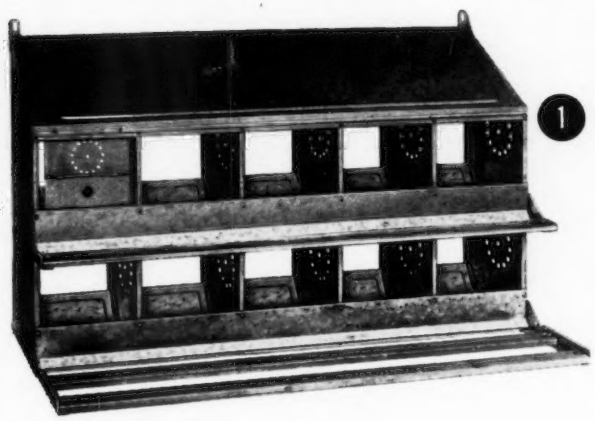
PEAT HARVEST MECHANIZATION WITH ULTRALOW-PRESSURE TIRES

What is claimed to be the first practical mechanization of peat harvesting was accomplished by equipping a scraper with rubber tires of thin, extremely pliable walls, combined with very low pressure. The scraper was hauled by a track-type tractor. With this equipment the tires absorbed or conformed to the uneven ground surfaces without resisting them and glided over the extremely soft areas without bogging down. . . . . This equipment could move across peat bogs loading a 3-inch cut, which is the limit of cut, since cutting deeper would result in the low places filling with water. (Approximately 80 percent of the weight of peat – 800 to 1,000 pounds per cubic yard – is water.) . . . . A 30-foot-long cut filled the scraper which dumped the wet peat on the edge of the bog where it was stockpiled and later fed through a shredder and drier prior to shipment and sale. Heretofore, the mechanical peat-harvesting operation has been limited to dragline and tower setups on the edge of peat bogs, which have proved awkward and difficult to control the depth of cut.

NEW CHEMICAL SEAT CUSHION WILL IMPROVE TRACTOR RIDING COMFORT

What should prove comforting news, in particular for those who ride tractors, is announcement of a material for tractor seat cushions molded from a new chemical foam known as poly-ether urethane resin. The product is said to have three to five times the strength of foam rubber, only about one-third its weight, and much greater ability to withstand weather of all kinds, even strong sunlight. . . . . Laboratory and field tests are claimed to show that the new material not only lasts longer than foam rubber, but also that its good compression-deflection characteristics provide greater capacity to reduce shock waves from rough ground and thus give a more comfortable tractor ride.

Here's how Armco ZINCGRIP Steel meets exacting design requirements



When you design with Armco ZINCGRIP® Steel, you can choose a special grade to meet your exact requirements.

For example, parts for the hen nest (Photo 1) required sharp bends. Armco ZINCGRIP Steel Lock-Forming Quality met this special need.

On the other hand, parts for the feeder (Photo 2) called for deep draws, so Armco ZINCGRIP Steel Drawing Quality was specified. Neither of these special qualities was needed to fabricate the trough waterer (Photo 3), so it was made of Armco ZINCGRIP Steel Commercial Quality.

HOT-DIP COATING

Regardless of the special forming qualities needed to meet your design requirements, you can be sure of having the finest in zinc-protected steel by specifying any Armco ZINCGRIP grade. All are made by a continuous patented hot-dip process pioneered and perfected by Armco Research.

The zinc coating doesn't flake or peel during fabrication. In fact, it withstands as much forming as the base metal. The full commercial weight zinc coating provides excellent protection against corrosion for all types of livestock and poultry feeders, waterers, nests, brooders, and other barnyard equipment.

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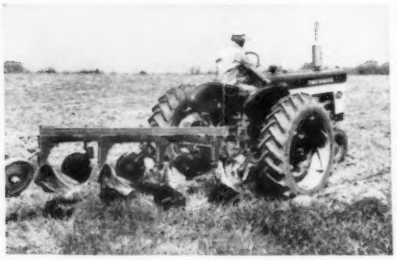

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Agricultural Engineering

January, 1959
Number 1
Volume 40

James Basselman, *Editor*

ASAE Motion Picture Progress

ASAE members received some welcome news during the Cabinet Meeting at the Winter Meeting in Chicago. L. W. Hurlbut reported that the Motion Picture Production Committee had completed the first phase of its assignment. He said that a satisfactory script has been written and approved except for minor changes, and that a contract has been signed to provide for the Motion Picture Service of the U.S. Department of Agriculture to supervise production of film, supply technical advice for shooting and production and exercise full responsibility for making a 13½-minute movie in full color under the supervision of the ASAE Motion Picture Production Committee. In addition the Motion Picture Service would prepare and distribute prints of the film to the general public through the facilities of its film libraries and television contacts. For its share, the Society is expected to pay an amount not to exceed the cost of producing the film and preparing release prints for distribution. It is anticipated that this amount will be approximately $23,000, including $5,000 for approximately 100 prints of the film for distribution to film libraries throughout the United States. This, of course, does not include the $2,000 already paid for producing the script and shooting sequence. The project now depends upon the availability of funds. A concerted effort on the part of ASAE members can make the long-awaited ASAE motion picture an early reality.

Goal and Target Date

With these facts established, the ASAE Motion Picture Finance Committee, J. W. Borden, chairman, met on the final day of the Winter Meeting. The Finance Committee set as its goal, $23,000, the amount required to complete the project. This would permit the balance on hand to be used for publicizing and promoting the film and to act as a cushion against additional costs, revisions, etc., which may arise before the project is completed. Since it is estimated that the film can be completed by fall providing funds are available, the Finance Committee established October 1, 1959, as the target date to raise the $23,000.

The realistic budget for raising the necessary funds was subdivided into four categories:

1 Colleges with agricultural engineering departments	$5,000
2 ASAE sections	8,000
3 Industry	7,000
4 Special individual contributions	3,000
	$23,000

Editor's Note: Members of the Motion Picture Production Committee are: L. W. Hurlbut (chairman), D. E. Kuska, D. O. Hull, G. E. Ryerson, G. O. Woodward, M. L. Esmay, H. S. Pringle, E. T. Swink, T. J. Brevik, H. H. Beaty. Members of the Motion Picture Finance Committee are: J. W. Borden (chairman), F. C. Walters, R. G. Morgan, J. T. Phillips, Jr., W. J. Ridout, Jr., D. L. Searls, A. J. Schwantes, L. E. Bradley, T. K. Swearingen. A picture of the Finance Committee is shown on page 38 of this issue.

A subcommittee of the Finance Committee was set up for each field of contact. A. W. Farrall, head of agricultural engineering, Michigan State University, was selected as chairman of contributions from colleges and universities having agricultural engineering departments. A. J. Schwantes, head of agricultural engineering, University of Minnesota, was appointed as assistant.

R. G. Morgan, district manager of industrial division, Timken Roller Bearing Co., was selected as chairman of contributions from sections with assistance from W. J. Ridout, editorial director, *Electricity on the Farm*, and J. L. Butt, executive secretary of ASAE. It was the feeling of the Committee that the sections would welcome the opportunity to undertake a major project in support of an activity showing as much promise in publicizing their own profession. This has been set up as the *only category* in which ASAE members would be contacted for personal contributions.

F. C. Walters, project engineer, John Deere Research and Engineering Center, was selected as chairman for contributions from industry with assistance from L. E. Bradley, field manager, American Zinc Institute, and J. T. Phillips, Jr., executive vice-president, Lilliston Implement Co.

The field of contact identified as "special individual contributions" was established for certain members or friends of ASAE who the Committee felt might want to make a special contribution toward a motion picture on agricultural engineering. J. W. Borden, vice-president of sales, Eversman Mfg. Co., was selected as chairman with assistance from D. L. Searls, manager, Adams Electric Coop., and T. K. Swearingen, manager of agricultural dept., Masonite Corp., and perhaps some of the past-presidents of ASAE.

Convinced that interest and appreciation are directly proportional to effort, the Finance Committee felt that ASAE members should play the major role in financing the project. For this reason the highest goal was set for the ASAE sections, since this is the only area where ASAE members can be contacted individually, except, of course, those included in the special contribution group. Each section is invited to establish a goal of its own. The goal should be based on the ability of the section to pay as determined from section meetings, attendance, frequency of meetings, status of treasury and fund raising opportunities.

Many sections have been waiting for an opportunity to support a worthwhile project. The motion picture whose purpose is "to interest young people in the challenges, opportunities, and rewards in agricultural engineering," and whose objective is "to help increase the supply of qualified agricultural engineers to meet the increasing need for them in research development, production, management and education," can serve an important need in the development of the profession and can stimulate interest in section activities. A successful organization is a working organization, and we feel that ASAE members will rise to the occasion.

• MACHINE
• METHOD

Efficiency in Combining Wheat

William H. Johnson
Member ASAE

Methods and machines are evaluated for determination of efficiency in terms of cost, quality of product, weather risk and machine functionability

THE agricultural engineer has responsibility in developing methods of harvest. This is normally considered in terms of a machine or series of machines, their development and evaluation. There are many criteria which provide a basis for evaluation of a method and its related machines. Some of them are: cost, labor required, ability to maintain a suitable quality product, efficiency, weather risk, functionability of the machines and others. To make an adequate evaluation, fundamental information is needed which characterizes the factors that are to be considered. This paper summarizes work which contributes to a better understanding of the fundamental information for the combining of soft red winter wheat.

The study determined method and combine efficiencies at various harvest dates and moisture contents. In accomplishing this, certain fundamental information concerning the harvesting of soft red winter wheat became apparent. Condition and quality of the resulting grain was determined.

At the start of the work it was reasoned that getting the grain out of the field at the earliest possible date would be advantageous both from the standpoint of minimizing grain loss and preserving good grain condition or quality. In delayed harvest, the chances of lodged grain, high shatter loss, high cutterbar loss, and secondary weed growth are much greater.

Method of Study

Potential Condition and Quality of the Grain — The term "grain condition" as used here is to denote the physical condition of the grain. It is characterized by test weight, 1000 kernel weight, germination and moisture content. Quality is used to denote the actual milling and baking characteristics of the grain as measured by standard milling and baking tests.

A study was made to determine the native condition or quality of the grain typical of each stage of harvest. This evaluation provided a check or standard with which the grain resulting from any treatment could be compared. It will be referred to as the potential condition and quality of the grain.

The system of obtaining the potential condition and quality samples involved cutting a sample of standing grain from four random areas of the field. The bundle of grain from each area was divided and two samples accumulated. One was threshed immediately, the other was shocked and threshed dry. These samples were taken once or twice daily until the grain was well through the normal combine season. Thereafter samples were taken about twice weekly.

Much of the fundamental information such as moisture content, test weight, germination, dry matter loss and kernel damage as influenced by date of harvest came from this phase of the study.

Method and Combine Efficiency — Method efficiency indicates how much of the theoretical yield the combine can harvest whereas combine efficiency indicates the efficiency of the combine in handling the material it receives.

Combine efficiency tests were run at grain moisture contents between 28 and 12 percent, combine adjustment was varied. The determination of combine efficiency followed the system of McCuen and Silver (1)*. An area of $\frac{1}{100}$ acre was established in the field. The combine was loaded ahead of the test plot. Samples of grain, chaff, straw, and at times tailings were collected from the combine in the test area. The grain from the straw and chaff samples was reseparated and rethreshed to obtain the grain losses. Cylinder, rack, and shoe losses were determined from these tests. The sum of these three losses is considered to be machine loss.

Cutterbar and shatter loss determinations were made for calculating method efficiency. Cutterbar loss was determined from the amount of grain picked up from five $\frac{1}{10,000}$-acre random areas within the combine test plot minus the amount of grain on the ground ahead of the combine from an equivalent area.

Shatter loss proved to be most satisfactorily evaluated by placing screen trays between rows at random locations over the field. Daily checks were made on these trays. Even so, birds or insects tended to hamper the evaluation.

Grain samples which resulted from the field tests were weighed, sampled for moisture content, rapidly dried with forced air and saved for various condition and quality determinations.

It was difficult to determine a theoretical yield from the combine efficiency tests. This is true because of the difficulty of evaluating shatter loss and because bird or wildlife damage could not be satisfactorily evaluated. It seemed important to evaluate the amount of grain harvested as influenced by date or moisture content. In order to do this an experiment was designed which replicated various dates of harvest and moisture contents at harvest five times. Within each

Paper presented at the Winter Meeting of the American Society of Agricultural Engineers, Chicago, Ill., December 1957, on a program arranged by the Power and Machinery Division.

The author — WILLIAM H. JOHNSON — is assistant professor, Ohio Agricultural Experiment Station, Wooster, Ohio.

*Numbers in parentheses refer to the appended references.

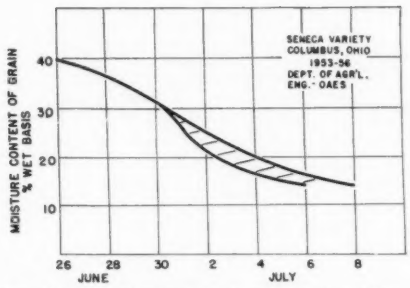

Fig. 1 Rate of drying of wheat grain at Columbus, Ohio, 1953-56

of these plots the grain tank yield, machine losses and cutterbar loss was determined.

In the field test work, six different combines were used, five pull type, with full width cylinders, and one 10-ft self-propelled machine. Not all were studied in detail; however, all were used in high-moisture grain. The data presented will be from the pull-type combines unless otherwise stated. A range of machine adjustments was run during the course of the study. Specific machine variables will be stated for a particular consolidation. Straw length threshed was held constant at about 24 in. All weights taken in the field were corrected to 13½ percent moisture before data were compiled.

Condition and Quality Determinations — Grain condition was evaluated according to the appropriate standard procedures or in many cases by service laboratories.

In all cases test weight expressed in pounds per bushel determined US grade. Germination is expressed in percent normal seedlings and 1000 kernel weights in grams.

Grain quality tests were conducted by the Soft Wheat Laboratory, Wooster, Ohio, according to prescribed standard methods.

The grain involved in condition or quality determinations was brought within the range of 12 to 13½ percent for test.

Harvest Characteristics

In the presentation of data the five years have been combined where applicable. In many cases a range of values is given. This range denotes the amount of variability noted for the years studied. This method seems more desirable than presenting single values. These results are drawn from the potential condition and quality samples.

The drying rate of the grain on various days during maturation appears to be about 2.5 percent per day for Ohio conditions. There would normally be about four days between 20 and 14 percent (Fig. 1). One year during the study there were 16 days. A delay of the grain harvest will

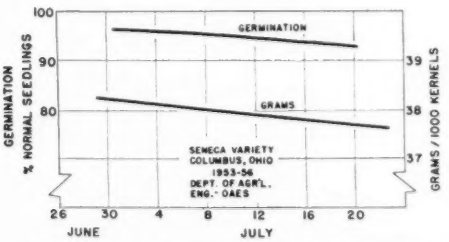

Fig. 3 Influence of time wheat stands in the field on germination and weight per 1000 kernels

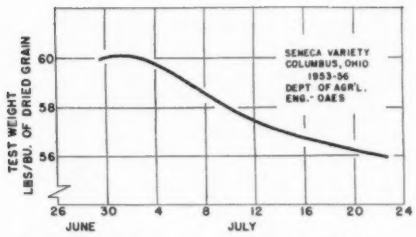

Fig. 2 Influence of time wheat stands in the field on test weight

result in considerable loss in test weight. The period of highest test weight is relatively short (Fig. 2). The rate of test weight loss appears to be about 0.23 lb per bu per day.

Test weight is a weight per unit volume which provides a basis by which grain is marketed. Also millers use test weight as an indication of flour yield. A reduction in test weight is not extremely significant in reducing the market price of grain. According to the present market structure the following is the relationship of test weights and price discounts: 60 lb per bu or over, 1¢ premium, 58 to 60 no discount, 57 — 1¢ discount, 56 — 3¢, 55 — 6¢, 54 — 9¢.

The cause of the reduction in test weight versus time caused much concern. The following evaluation will contribute to an understanding of this.

The 1000-kernel weights reduced only slightly with time (Fig. 3). The 1000-kernel weights are relative to dry matter yield per acre. It was postulated that the reduction in test weight was caused by dry matter loss through leaching or oxidation. Since in 20 days the reduction of dry matter is only in the order of 1.4 percent, whereas the drop in test weight for the same period is 6.5 percent, dry matter loss does not account for the test weight reduction. Apparently the alternate wetting and drying results in a wrinkling of the bran which consequently results in poorer packing of kernels in the test container.

The germination reduces only slightly as grain stands in the field (Fig. 3). It is doubtful if the reduction in germination as shown has much practical significance.

Evaluations were made to determine the effect of delayed harvest on quality as measured by milling and baking tests. The following slight differences were detected (See Table 1):

(*a*) Break flour yield increased with time of exposure. High break flour yields are an indication of greater quantities of fine flour produced at the head end of the experimental milling process.

(*b*) Pearling index increased with time of exposure.

TABLE 1. RESULTS OF MILLING AND BAKING TESTS ON THE POTENTIAL QUALITY WHEAT SAMPLES*

Date	Break flour yield, percent	Pearling index, percent	Particle size index, percent	Flour yield, percent	Mixogram area, sq cm	Cookie diameter, cm X 2	Protein	
							Wheat	Flour
June 29	22.7	47.4	16.7	68.5	72	17.9	10.7	9.4
June 30	25.7	45.5	20.0	67.9	69	18.0	9.1	7.9
July 1	23.1	44.9	19.4	68.1	71	17.7	9.9	8.6
July 3	24.1	45.3	16.8	67.7	69	17.6	10.0	8.7
July 8	24.6	49.3	20.8	69.9	70	17.7	10.0	8.8
July 24	31.0	58.8	27.7	67.5	68	18.0	10.4	9.1
LSD, 5%	2.1	1.1	2.5	2.5	3.7	.3	—	—

*From samples field cut, stored and threshed dry, 1953

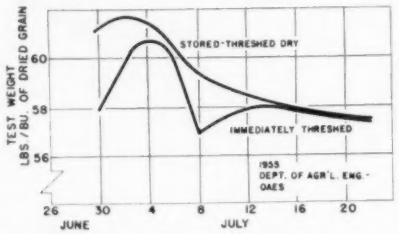

Fig. 4 Comparison of dry threshing and high moisture threshing on the resulting test weight

The greater the pearling index, the softer the kernel texture.

(*c*) Particle size index increased for the same three week period of exposure. The higher the particle size index the finer was the resulting granulation.

There was essentially no difference among samples for the remaining evaluations. The major difference associated with extended exposure of the grain to the weather is to soften the kernel. Quality for baking seemed unchanged. In general, the time grain stands in the field does not significantly alter the quality as long as grain is handled well during and after harvest.

Effect on the Grain of Threshing at High Moisture

It is indicated that wheat should be harvested as early as July 1, or at 27 percent grain moisture to obtain highest test weight (Fig. 2). This approach was taken; however, when the grain was threshed at high moisture the potential test weight was not preserved (Fig. 4). The deviation of the two curves around July 8 marks a period of rain which increased the moisture content of the grain. The same data are illustrated in Fig. 5 for the original drying period only. Similar data taken by Berg, Ottosson, and Aberg corroborates the data of this study (2). An attempt was made to generalize all work regarding the reduction in test weight which results from threshing (Fig. 6). A range of the reduction in test weight is proposed because cylinder speed, cylinder-concave clearance and cylinder type will influence the test weight reduction at any moisture content.

Germination is also affected by the high moisture harvest (Fig. 7). The same qualifying factors justify the proposed range of values in this generalized curve.

It seemed that the cause of the reduction in condition of the immediately threshed wet grain need be established. Additional dry-matter accumulation below 30 percent was postulated but proven false in that a statistical correlation

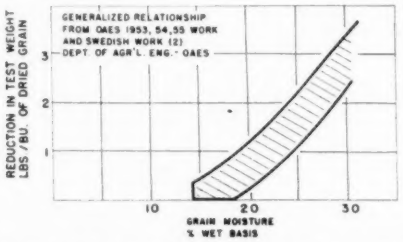

Fig. 6 Range of reduction in test weight for immediately threshed over stored-dry threshed grain

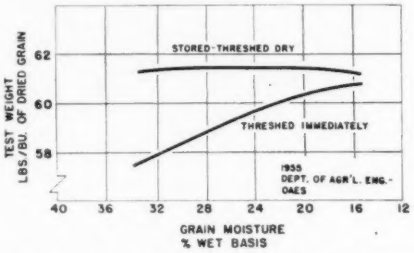

Fig. 5 Comparison of dry threshing and high-moisture threshing on the resulting test weight

between test weight and 1000-kernel weight failed to show significance, $r=0.05$ whereas r 5 percent$=0.298$ for 44 samples. This means that there was no tendency for the lowered test weight samples to also have a lowered dry-matter content.

Further examination of the high moisture threshed samples revealed split kernels; however, the seed coat of these kernels was intact on one side. This increased the volume of the kernel. A count of the number of split kernels is presented in Table 2.

TABLE 2. SPLIT KERNELS FOUND IN SAMPLES HARVESTED AT VARIOUS MOISTURE CONTENTS

Percent grain moisture as threshed	Percent of kernels split, by weight
33.4	10.3
29.4	7.3
23.4	2.7
20.3	1.0
18.4	1.0
15.8	0

From these data it appears that kernel damage accounts for the drop in test weight. No attempt has been made to relate the amount of split kernels to a quantitative reduction in test weight.

The decrease in the germination of the wet-threshed grain could also be explained on the basis of kernel damage.

An attempt was made to minimize such damage by selecting a proper combination of the following cylinder and concave types: rubber angle bar cylinder, steel rasp bar cylinder, rubber covered concave bar, steel concave bar, grated concave, and solid concave. No combination was found which significantly reduced the kernel damage(3).

It would appear from the standpoint of the resulting grain condition that threshing must be limited to grain moisture contents below 20 percent.

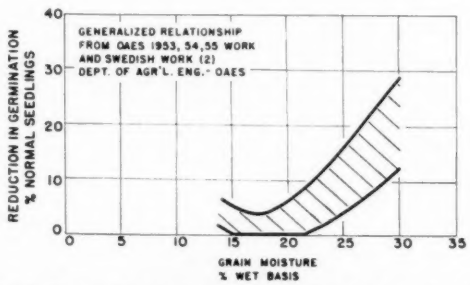

Fig. 7 Range of reduction in germination for immediately threshed over shocked grain

Efficiency of Method and Combine

As indicated before, the combine must be evaluated in two ways: *(a)* When considering the combine season how much of the theoretical yield can the combine harvest, and *(b)* What is the efficiency of the machine at various stages of the harvest season in handling what it does receive.

With respect to item *(a)*, Fig. 8 represents the potential grain which can get into the combine and accounts for the various field losses. In generalizing, it can be stated that with each day of delay after 30 percent grain moisture, there is 12 lb per acre less grain available for harvesting.

Determination of combine efficiency at various stages of harvest is somewhat more involved. Again most of the results are proposed in the form of ranges of values. Seasonal differences seemed quite extreme even though similar varieties and machines were used.

The combine efficiency study was made during two distinct periods of the harvest season. The first period, is characterized by the fact that the crop is losing moisture in maturation. The second period, called the rewetting and drying period, is that condition after the grain has dried and come into equilibrium with the prevailing climatic conditions. Only the first period will be reported here and for all practical purposes can be used to characterize high-moisture harvest; however, straw moisture is necessary to denote the condition of the crop during the second period.

Cylinder Loss

An increase in moisture content at the time of combining results in higher unthreshed grain for any one cylinder-concave clearance or cylinder speed (Fig. 9). It seems just as evident that with a closer cylinder-concave clearance or a higher cylinder speed, the cylinder loss can be kept well below one percent. From this it seems that present combine cylinders have the capability of threshing high-moisture grain. In this series of tests the cylinder speed was constant at 1400 rpm.

Rack Loss

Rack loss apparently increases at both extremes of the moisture range. See Figs. 10, 16, and 18. In the low-moisture range (below 13 percent straw moisture) this is undoubtedly due to overthreshing of the straw, whereas at high moistures (above 19 percent straw moisture) threshing is less complete and kernel density is lower retarding separation. It would appear that intermediate straw moistures (13 to 19 percent) would be quite desirable in minimizing loss. It should be noted that during the normal combining period straw moistures will normally be below grain moistures. This is not true, however, for early morning or late evening combining.

Shoe Loss

Shoe loss appears to increase as the moisture content decreases; although the exact relationship is difficult to determine because of the many adjustments possible for optimum shoe operation (Figs. 11 and 17). In a series of tests involving shoe adjustment there appeared to be no great difference in the optimum adjustment of the shoe in the moisture range of 16 to 20 percent as compared with normal combine moistures.

An increase in moisture content reduces shoe load significantly. This can be seen in Figure 12.

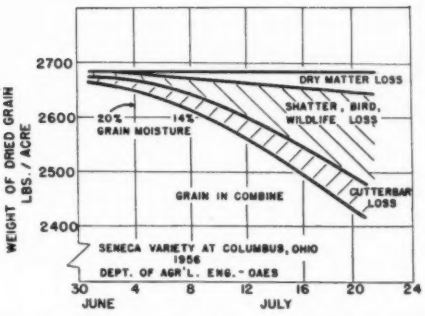

Fig. 8 Sources of field loss of grain as the harvest date progresses

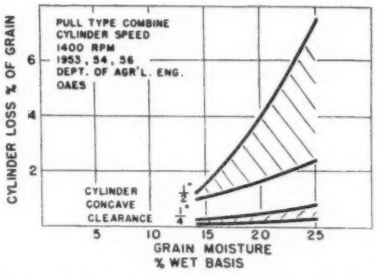

Fig. 9 Influence of grain-moisture content on cylinder loss during the grain maturation period

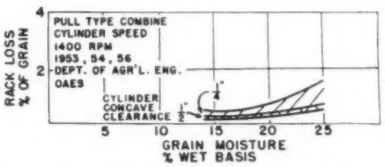

Fig. 10 Influence of grain moisture content on rack loss during the grain maturation period

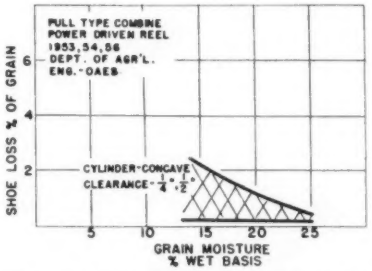

Fig. 11 Influence of grain moisture content on shoe loss during the grain maturation period

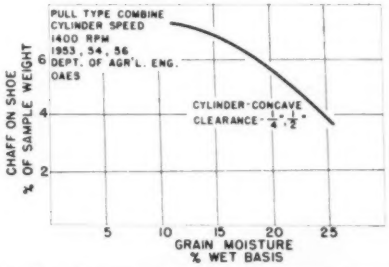

Fig. 12 The influence of grain moisture content on shoe load during the grain maturation period

. . . Efficiency in Combining

Machine Efficiency

Fig. 13 presents a consolidation of cylinder, rack and shoe loss which represents those losses which can best be influenced through machine adjustment. These curves are largely influenced by cylinder loss. It should be noted that the lowest loss occurred between 15 and 20 percent at ¼-in. cylinder-concave clearance.

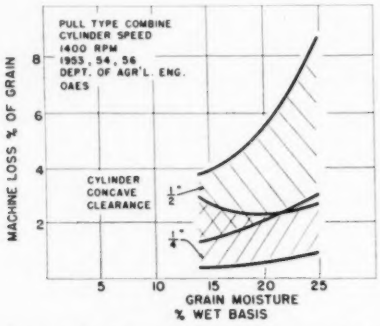

Fig. 13 Influence of grain moisture content on total machine loss during the grain maturation period

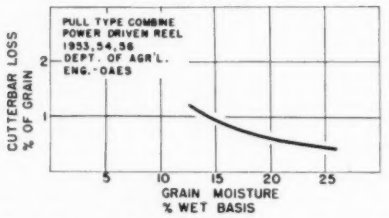

Fig. 14 The influence of grain moisture content on cutterbar loss during the grain maturation period

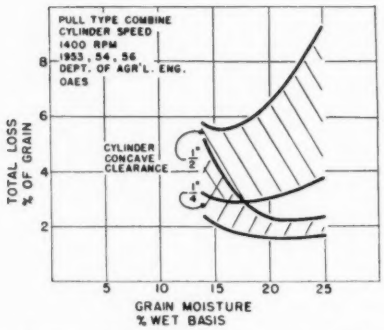

Fig. 15 Influence of grain moisture content on total grain loss during the maturation period

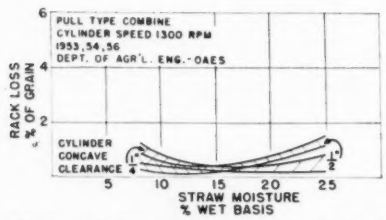

Fig. 16 Influence of straw moisture content on rack loss during the rewetting and drying period of harvest

Cutterbar Loss

In many respects the data in Fig. 8 illustrates the best relationship of cutterbar and shatter loss since both of these are influenced by time as well as moisture content. It is true, however, that the major loss experienced at the time of combining is many times cutterbar loss. For that reason it is desirable to see in a general way the influence of moisture content on cutterbar loss (Fig. 14).

Method Efficiency

When all the losses are consolidated and related to moisture content during the grain maturation period, the optimum stage of harvest comes at a moisture content higher than 14 percent (Fig. 15). The effect of shatter and cutterbar loss tends to shift the most desirable stage of harvest toward higher moisture contents, from 17 to 22 percent moisture.

Combine Functioning

All except one of the combines used functioned well in grain below 20 percent moisture except where rain or dew was on the surfaces of the straw. High moisture chaff does not handle as well as dry material in the tailings system. Clogging resulted in the one machine because the tailings flow was excessively restricted.

Power requirements of the combine were observed to be higher in high moisture grain, although no precise measurements were made. One auxiliary-engine-drive combine proved to be under-powered.

At no time was crackage or chaff content of the sample great enough to reduce the US grade.

Summary

This study was undertaken to determine the method and combine efficiency at various harvest dates and moisture contents in soft red winter wheat. *(Continued on page 29)*

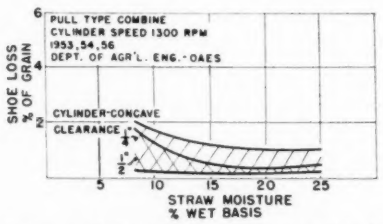

Fig. 17 Influence of straw moisture content on shoe loss during the rewetting and drying period of harvest

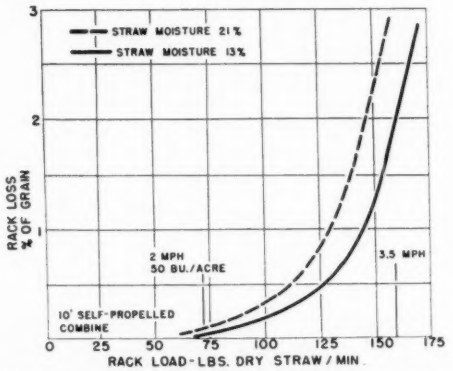

Fig. 18 Specific effect of straw moisture content on rack loss at various rack loads

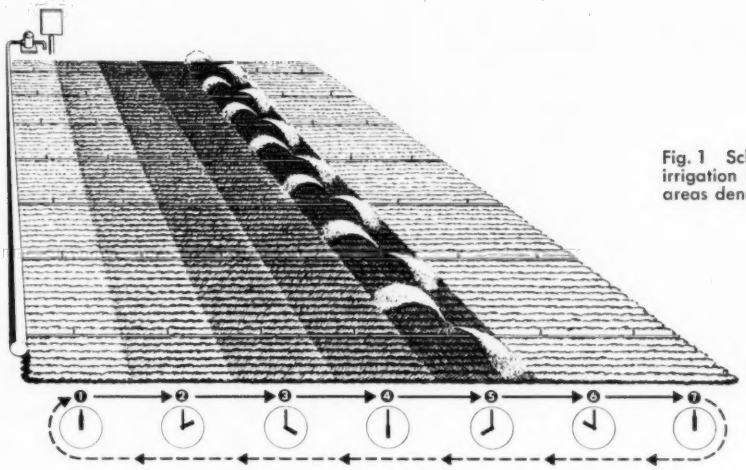

Fig. 1 Schematic diagram of the Sequa-Matic irrigation system in operation. Variously shaded areas denote sprinkling of the individual areas at different time intervals

Irrigation System Moves the Water, Not the Pipe

An electric timer and pressure-actuated valves replace the hired hand in providing automatic operation of an irrigation system — another advance toward automation on the farm

ANOTHER step in the reduction of labor requirements for farm operations was introduced recently in a demonstration of an "automatic sprinkler irrigation system" by the John Bean Division of Food Machinery and Chemical Corporation on a 20-acre potato crop of the John and Alex Kochergen Farm, near Huron, Calif.

Called "Sequa-Matic" irrigation the new system bases its claim to reduction of farm labor costs on the principle of moving the water and not the pipe.

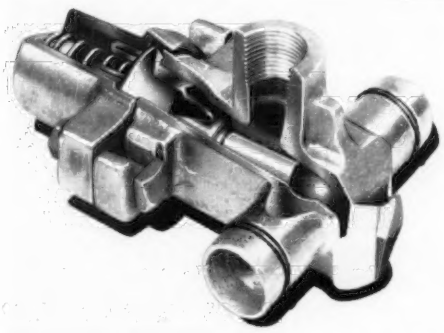

Fig. 2 Cutaway view of the Sequa-Matic valve that controls the sprinkling operation of the individual sprinklers through the action of line water pressure. The valve consists of a diaphragm and spring; a ball check valve with a stretchable stem; a metal plate with an orifice; and a special fluid

Since installations remain stationary, the system offers a means of automatically applying water to a crop throughout its life cycle to match its exact moisture requirement.

The system employs the use of a main supply line and multiple lateral lines, made up of 1¼-in. aluminum tubing, to form a solid grid-type installation with pressure-actuated valves and sprinkler outlets at designated intervals. The system is operated by the automatic regulation of water pressure at timed intervals as set on an electronic timer. Through this regulation and the operation of the valve, at each sprinkler, the first sprinkler in each line commences operation. Upon completion of the timed interval, the first sprinkler shuts off and the next sprinkler in line begins operation. This continues to the last sprinkler in the line, at which time the system resets and the sprinkling cycle is automatically repeated.

The heart of the system lies in the new Sequa-Matic valve that controls the sprinkling operation of the individual sprinklers through the action of line water pressure. The valve consists of a diaphragm and spring; a ball check valve with a stretchable stem; a metal plate with an orifice; a special fluid selected for this use. The valve assembly also incorporates a coupling means for attaching the lateral line pipe.

In addition to the aforementioned reductions in labor costs, the manufacturer reports that increased yields result from readily-available moisture throughout the life cycle of the crop.

Bulk-Milk Cooler Heats Water

M. C. Ahrens
Assoc. Member ASAE

Early tests indicate the feasibility of using heat energy from milk cooling process to preheat the amount of wash water required after each milking

REFRIGERATION units used on bulk-milk tanks today have, generally speaking, greater capacity than refrigeration units used on can coolers. Inasmuch as these refrigeration units are actually heat pumps that transfer heat energy from the milk to a coolant, the challenge to the engineer is to make practical use of the heat energy removed from the warm milk in the cooling process.

In most of the country, the modern milkhouse has at least two requirements for heat—water heating and space heating. Thus it seems only natural that the refrigeration unit used to cool large quantities of milk should be harnessed and used as a heat pump to supply some of the heat needed in the milkhouse. Otherwise, this heat is wasted—either down the drain, in the case of the water-cooled condenser, or into the air, in the case of the air-cooled condenser. Heating the air is advantageous at certain periods of the year. At other times, the air is already too warm.

Information available indicates the most common bulk-milk coolers on farms today are 200- and 300-gal sizes. With the trend to larger dairy farms, the typical cooler may be the 400-gal size in the near future. In one year a tank cooling 200 gal of milk a day will extract heat energy equivalent to more than 9,000 kw-hr. This then is the basis for potential savings in employing the heat pump in the milkhouse.

Paper was presented at the Golden Anniversary Meeting of the American Society of Agricultural Engineers, East Lansing, Mich., June 1957, on a program arranged by the Electric Power and Processing Division in cooperation with the Washington Agricultural Experiment Station. Approved for publication as scientific paper No. 1623, Washington Agricultural Experiment Station, State College of Washington, Pullman.

The author—M. C. AHRENS—is agricultural engineer, Agricultural Engineering Research Division, Agricultural Research Service, U.S. Department of Agriculture, Agricultural Engineering Department, State College of Washington, Pullman.

Procedure

The first phase of the experiment was to determine the effect of the important variables in employing the bulk-milk cooler as a heat pump to preheat water. This was a laboratory installation. Variables studied included: temperature of the preheat water; milking rate; and amount of hot water used. Equipment employing the principles shown in the schematic diagram, Fig. 1, was installed in the laboratory.

The equipment included the 400-gal direct-expansion tank with a 2-hp remote compressor designed for every-other-day pickup. The air-cooled compressor had a water-cooled condenser in parallel. Control by solenoid valves in the compressor discharge line determined which condenser operated. The solenoid valves were controlled by a single-pole, double-throw air thermostat. Air temperatures below thermostat settings called for heating by operation of the air-cooled condenser. Higher temperatures called for operation of the water-cooled condenser. When maximum economy is desired or milk house heating is not required, the air-cooled condenser may be omitted. A 180-gal tank equipped with immersion heater, thermostat, and circulating pump heated and maintained water temperature for the simulated milk load. This equipment is not shown in the diagram.

Heat pump data in this experiment were confined to the operation of the water-cooled condenser. When the compressor starts to operate, the water-regulating valve opens. The circulating pump then circulates water through the condenser into the top of the 42-gal preheat tank, out the bottom, and back to the pump.

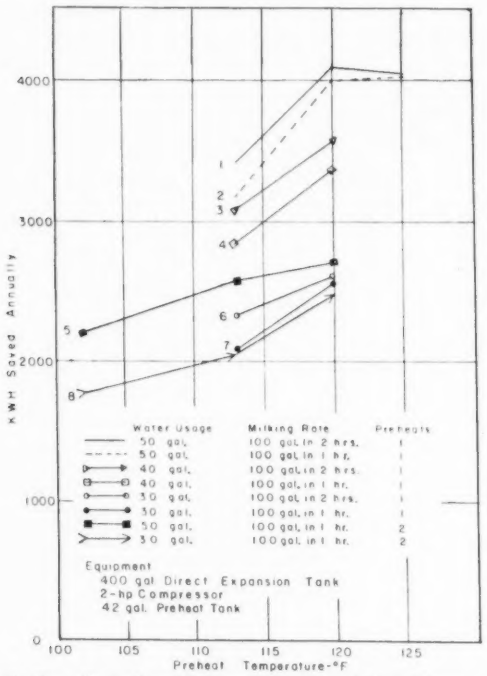

Fig. 2 The effect of preheat temperature on kilowatt-hours saved annually for various milking rates and various amounts of wash water used

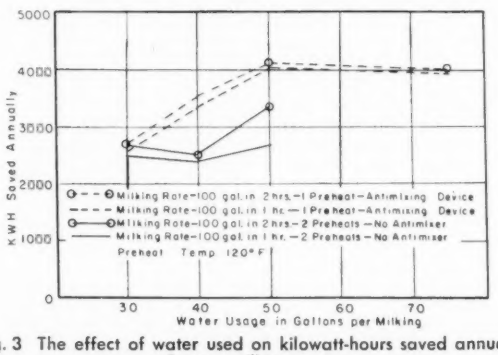

Fig. 3 The effect of water used on kilowatt-hours saved annually for two milking rates

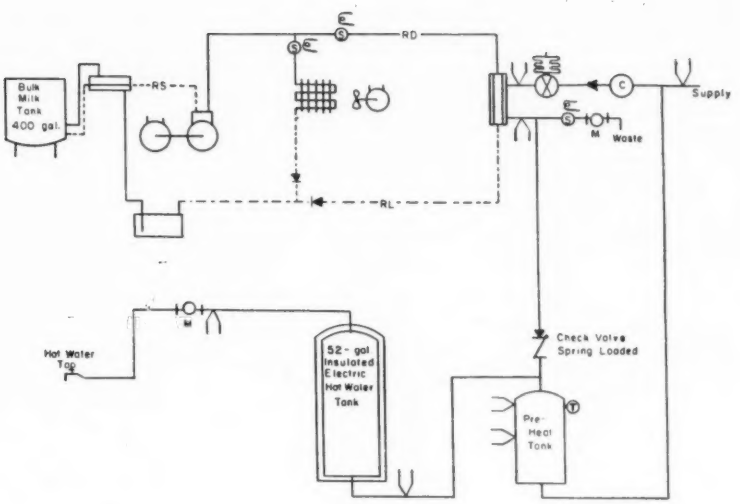

Fig. 1 Bulk milk tank heat pump water preheater

A typical cycle during water heating and milk cooling follows:

1 Milk enters the tank.

2 The bulk-milk-tank switch is turned on manually.

3 The tank thermostat calls for cooling the milk and opens the refrigerant-liquid-line solenoid.

4 Increased evaporation pressure activates the low-pressure switch which in turn closes the two-pole contactor.

5 Closing of the contactor starts the compressor motor and furnishes power to the air thermostat, which in turn selects either the water-heating or the air-heating cycle. When the water-heating cycle is selected, power is supplied to the immersion thermostat located in the top of the 42-gal preheat tank.

6 With the water in the preheat tank below the thermostat setting, the circulating pump operates.

7 When the preheat tank water reaches the immersion thermostat setting, the single-pole, double-throw switch turns off the circulating pump and opens the solenoid to allow the condenser cooling water to waste, at which time the water-regulating valve controls the amount supplied the condenser.

Instrumentation

In this experiment it seemed desirable to obtain sufficient data to calculate a heat balance. This heat balance helped provide a check on information and other data obtained. Water meters measured the amount of water (used as milk substitute) entering the milk tank as the load, the amount of supply water to the water system, the waste water from the condenser, and the amount of hot water drawn from the hot-water tank. Thermocouples recorded the necessary temperatures. Electrical data were taken to provide information on electric energy input to motors and to determine electrical characteristics.

Results

Fig. 2 shows the effect of preheat temperature on kilowatt-hours saved annually for various milking rates and amounts of hot water used. Preheat temperatures used were 102, 113, 120, and 125 F. However, not all milking and water usage schedules were run at all preheat temperatures. With this installation, selected preheat temperatures were usually reached before the end of a normal milking period. Therefore, the circulating pump had turned off and the compressor was operating conventionally, either water-cooled or air-cooled.

With the drawing off of hot water after milking, supply water replaced the water in the preheat tank, thus lowering

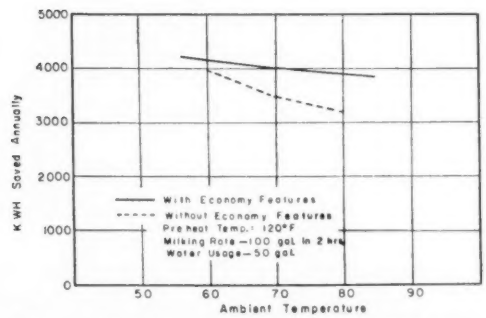

Fig. 4 The effect of ambient temperature on kilowatt-hours saved with and without economy features

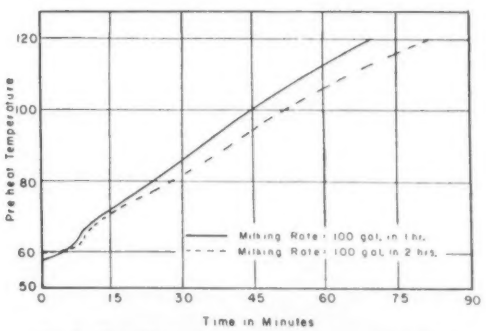

Fig. 5 The effect of time on preheat temperature

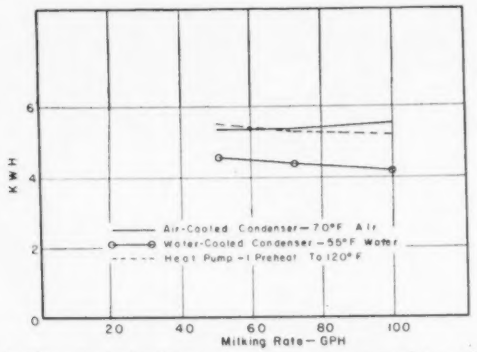

Fig. 6 The effect of milking rate on energy consumed to cool 100 gal of water for various condenser conditions

. . . Milk Cooler Heats Water

its temperature. The immersion thermostat would then call for heating, thus instigating the second preheat cycle. When this happened, the circulating pump, circulating the water sufficiently, mixed the remaining preheated hot water in the top of the preheat tank and the fresh cold supply water in the bottom, thus lowering the temperature of the water in the last part of the draw-off.

To maintain operation with only one preheat, a set of relays was employed. Once the preheat temperature has been reached and the unit reverts to normal operation, the relays cut out the preheat control thermostat until the compressor shuts off. When the compressor comes back on again, either for normal holding of the milk temperature or for the start of the next milk cooling period, the preheat thermostat will be in effect and preheating will again take place, providing the temperature of the preheat water is below the thermostat setting.

The advantage of a single-preheat over a two-preheat cycle when the amount of hot water used is approximately the same as the capacity of the preheat tank is readily seen by comparing curves 2 and 5 (Fig. 2). When the amount of hot water used is less than the capacity of the preheat tank, there is very little difference between one and two preheats in kilowatt-hours saved, as comparing curves 7 and 8 shows (Fig. 2).

Increasing preheat temperature of the water or increasing the amount of water used at a given temperature will increase savings, other factors remaining the same. In this experiment, however, other factors did not remain the same with increased preheat temperatures. The main difference was the increased energy consumption by the compressor motor and the water-circulating-pump motor.

The preheat temperature was increased until the savings no longer increased. This point proved to be somewhere between 120 and 125 F., as evidenced by curves 1 and 2 (Fig. 2). These two curves are of primary importance in this research as they tend to establish conditions of operation for maximum economy. This point then fixes one of the variables which we seek to eliminate in this research, the optimum preheat temperature.

A slight economical advantage is shown for operating at a milking rate of 100 gal in 2 hr in comparison with 100 gal in 1 hr. Test data indicate that this advantage results from the facts that the increased energy consumption of the compressor motor for the heat-pump operation over the conventional straight cooling operation is greater for the 1-hr rate than for the 2-hr rate. This increase must be subtracted from the potential saving. This fact is evidenced by comparing curves 1 and 2, or 6 and 7 (Fig. 2).

Fig. 3 shows the effect of water used on kilowatt-hours saved annually for two milking rates. With the incorporation of the antimixing device and the single preheat, a nearly straight-line increase in savings is effected until the amount of water used exceeds the capacity of the preheat tank.

Fig. 4 shows the effect of ambient temperature on kilowatt-hours saved, with and without economy features. This figure shows the advantages of economy features and indicates decrease in kilowatt-hours saved by the improved system as the ambient temperature increases from 55 to 85 F. The economy features include single preheat, an antimixing device in bottom of preheat tank, and insulation of the preheat tank and lines containing hot water.

Fig. 5 shows the rate of temperature rise of the water in the preheat tank for milking rates of 100 gal in 1 hr and 100 gal in 2 hr. The main point of interest is the time required for the water to reach 120 F. This time was 67 min for the 1-hr and 82 min for the 2-hr rate. This means that full economy would not be obtained when wash water was drawn immediately after the milking at the 1-hr rate, the water temperature at this time being 116 F., if the preheat temperature was 57 F at the start of the milking period. The irregularity in the curve during the first few minutes is caused by the delay in circulation until the head pressure builds up enough to open the water-regulating valve.

The effect of milking rate on power consumed to cool 100 gal of water from 95 to 40 F for various condenser conditions is shown in Fig. 6. Note that the milking rates used have very little effect on energy consumed to cool the milk substitute (water). The data also show the electric energy required by the system operating on an air-cooled condenser in an ambient temperature of 70 F. These two types of operation are also readily compared with the energy required when operating as a conventional water-cooled condenser with a head-pressure setting of 110 psig. About one-half the increased energy is consumed by the condenser-fan motor and the water-circulating-pump motor in the cases of the air-cooled and heat-pump operations, respectively.

Fig. 7 shows the effect of ambient temperature on energy consumed to cool 100 gal of milk substitute (water) for the heat pump and for the air-cooled condenser. Only a slight

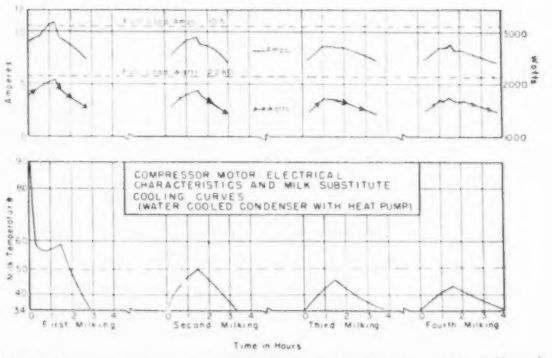

Fig. 8 Compressor motor electrical characteristics and milk substitute cooling curves (Water cooled condenser with heat pump)

change in the energy consumed occurs for the heat-pump operation between the ambient temperatures of 56 and 85 F, but the energy consumed during operation on the air-cooled condenser increased as expected. A significant point here is the fact that fewer kilowatt-hours are required to cool 100 gal of milk substitute (water) while preheating 42 gal of water to 120 F than to cool 100 gal of milk substitute while operating on the air-cooled condenser when the ambient temperature is 76 F or more.

Fig. 8 shows the compressor-motor characteristics for the four successive loadings which simulate the four milkings between pickups. During the first loading the compressor motor exceeded full-load current by 4 percent for approximately 15 min during the preheat cycle. Data for the cooling curves shown were taken simultaneously with the electrical characteristics and plotted on the same time base. The loading rate used was 100 gal in 1½ hr, as allowed by the 3A Standards. The upswing in the temperature curve during the last half-hour of the first loading is attributed to the decreased capacity of the compressor as the head pressures increase during the preheat cycle.

Fig. 9 compares the energy consumed by the heat pump on preheat cycle and by the conventional water-cooled condenser. Here we can note that approximately half of the increased energy consumed during the heat pump operation is required by the circulating-pump motor. The over-all increase in energy consumption is about 17 percent. This energy consumption is greater than that of the conventional water-cooled condenser. The increased energy consumption for each successive milking as the tank is filled is readily seen. Two factors tend to cause this: *(a)* the average suction pressure during cooling is less with each successive loading, and *(b)* as the tank fills, the heat loss through the tank wall increases.

Summary

Results of the project obtained thus far show that by using a 400-gal direct-expansion tank with a 2-hp compressor, the normal design size for every-other-day pickup, savings of 4,000 kw-hr per year can be obtained. Such savings were made by preheating water to 120 F from a supply temperature of 55 F and using 50 gal of wash water after each milking. Fewer kilowatt-hours were required to cool 100 gal of milk substitute using the heat-pump method while also heating 42 gal of water to 120 F than with the conventional air-cooled condenser in an ambient temperature of 76 F or more. These early results also indicate that the preheat tank should have a capacity about equal to the amount of wash water used after each milking. Results also show that there is very little reduction in cooling capacity of the compressor operating as a heat-pump water heater for the conditions described.

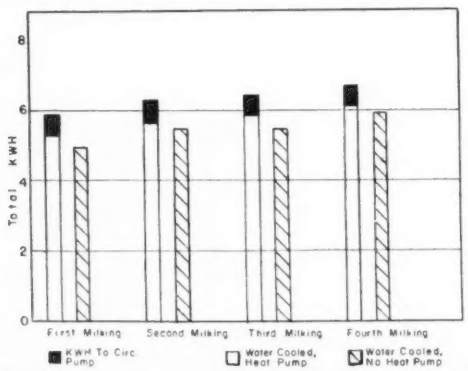

Fig. 9 Comparison of energy consumed for 400-gal bulk-milk tank; *(a)* heat pump, water cooled *(b)* no heat pump, water cooled.

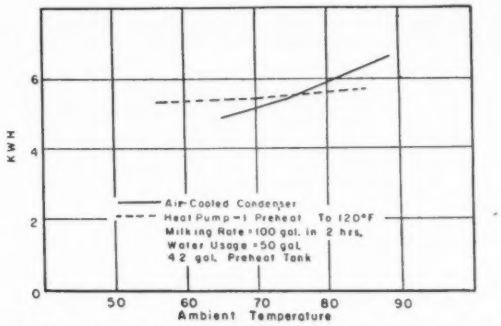

Fig. 7 The effect of ambient temperature on energy consumed to cool 100 gal of water for various condenser conditions

Definitions

Preheat temperature: average temperature of water in preheat tank.

Kilowatt-hours saved annually=

$$\frac{(T_o - T_s)\ 8.3 \times \text{gal water used per year}}{3413}$$

—additional energy to compressor and circulating pump per year

T_o: Average water temperature from preheat tank

T_s: Average temperature of supply water

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1959 ASAE Membership Roster

IN order that the latest changes can be made in the 1959 ASAE Membership Roster to appear in the 1959 AGRICULTURAL ENGINEERS YEARBOOK, corrections must be received by February 1. For convenience in making corrections a clipping from the 1958 roster was attached to the 1959 membership dues invoice. Please make any necessary corrections when dues are paid. Those who find it necessary to delay payment of dues beyond February 1, are requested to return the bottom of the invoice with necessary changes. It is important also that information concerning classification by employment or business be furnished as is requested on the dues invoice.

Selected Intense Storms
in the Little Sioux River Watersheds

H. P. Johnson
Assoc. Member ASAE

R. K. Frevert
Member ASAE

Design information for such structures as reservoirs, spillways and culverts was obtained during an eight-year study on five agricultural watersheds

HYDROLOGIC studies were initiated in 1950 on several agricultural watersheds in the loess area of western Iowa. The objectives of the studies were primarily *(a)* to obtain design information on rainfall and runoff for such structures as small reservoirs, spillways and culverts, and *(b)* to determine the effect of structural treatment and land treatment on the nature of runoff from the watersheds. Several unusually intense rains have been recorded in the eight years of record. Two of the storms were intense and of short duration causing high peak rates of runoff for the areas involved. The third, a storm of somewhat more than one hour in duration, resulted in a large volume of runoff.

Paper presented at the Winter Meeting of the American Society of Agricultural Engineers at Chicago, Ill., December 1957, on a program arranged by the Soil and Water Division. Approved as Journal Paper No. J-3315 of the Iowa Agricultural and Home Economics Experiment Station, Ames, Project No. 1266.

The authors—H. P. JOHNSON is research associate, Agricultural Experiment Station, Iowa State College, Ames, and R. K. FREVERT is former assistant director, Agricultural Experiment Station, Iowa State College, now director, Agricultural Experiment Station and professor of agricultural engineering, University of Arizona, Tucson, Arizona.

Acknowledgment: The authors wish to acknowledge the cooperation of the Soil Conservation Service and the Soil and Water Conservation Research Branch, Agricultural Research Service, United States Department of Agriculture, and also the work of H. P. Guy who aided in initiating the studies.

Watersheds and Instrumentation

The watersheds selected for this discussion are located in the drainage basin of the Little Sioux River southeast of Sioux City, Iowa. The five watershed areas vary from 49 to 309 acres (see Table 1). The soils, largely Ida and Monona silt loams, are loess derived and are permeable to great depths, the loess mantle being 100 ft deep in some areas of the region. Clay contents range generally from 10 to 20 percent. The land slopes are steep, about one-half of the land of four of the five described watersheds having slopes greater than 10 percent. Cultivated slopes of more than 15 percent are not uncommon.

The length of the principal waterway described in Table 1 refers to a length from the uppermost point of channel development along the channel to the gaging station. The average slope of the principal waterway excludes any drops in elevation through flumes. It includes the slope through the reservoir storage area. Thus the slope figure given is less than the average slope of the natural channels above the storage area. It should be noted that the watershed areas above TMO and NMO (Figs. 1 and 2) are not described because the construction has considerably altered the original areas and waterway slopes, and thus the watersheds are not natural watersheds.

Although cropping practices vary within the watersheds from year to year, about one-third of the area, exclusive of roads and yards, is planted to corn, one-third to oats and one-third to hay land and pasture. However, during 1957, a large part of the crop land in the watersheds was placed in the Soil Bank. Much of this was in row crop the previous

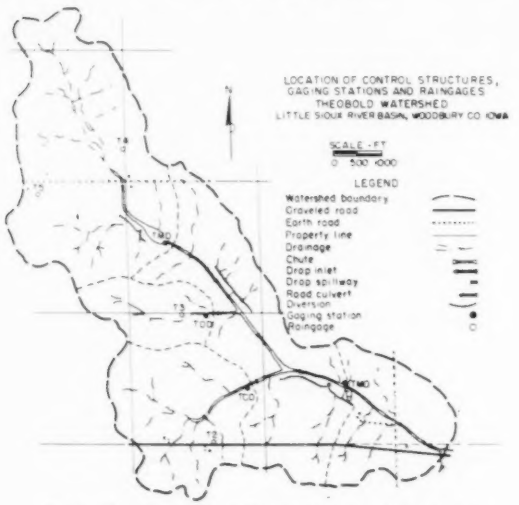

Fig. 1 *(Above)* Map of Theobold watershed, Woodbury Co., Iowa, shows location of subwatersheds TCD (151 acres), TMD (309 acres) and TDD (63 acres)

Fig. 2 *(Right)* Map of Nepper Watershed, Monona Co., Iowa, shows location of subwatersheds N-SW-D (49 acres) and NMD (125 acres)

TABLE 1. CHARACTERISTICS OF WATERSHEDS

	Percent	Watersheds N-SW-D	NMD	TCD	TMD	TDD
Area, acres		49	125	151	309	63
Slopes on percent of area	0-5	39.3	28.7	25.8	29.4	17.8
	6-10	52.7	11.1	7.9	23.6	25.2
	10-20	8.0	58.9	66.3	45.1	57.0
	Over 20	0	1.3	0	1.9	0
Length of principle waterway, feet		2200	2850	3050	5350	2400
Average slope of principle waterway, percent		4.5	3.8	3.4	1.9	4.4
Form factor (area/length^2)		0.41	0.51	0.76	0.86	0.38

year and provided poor cover since little attempt was made to establish a cover crop. Portions of the steepest land and land along large waterways are left in permanent pasture. A yearly record of the acreage of corn, small grain, and hay land and pasture is kept. Portions of the row-crop acreage in the various watersheds are farmed on the contour, which varies from farm to farm. Fifteen percent of the land in watershed N-SW-D (Fig. 2) is terraced. No more than 4 percent of the land on the other watersheds is terraced. Level terraces, which act as small reservoirs, are used. Level terraces are feasible in this area because infiltration rates are high and subsoil homogeniety results in a relatively constant hydraulic conductivity with depth.

Rainfall amounts and intensities are measured by Fergusson or Friez recording rain gages. The locations of the gages may be seen on the watershed maps (Figs. 1 and 2). Two types of runoff measuring stations are used. In those watersheds, which are identified by a series of letters ending in D (for detention), the rate of rise of the water surface in a small reservoir is recorded. In those watersheds, whose identifying letters end in O (for outlet), a drop spillway is used as a control section. The stage recorder wells are 15-in. diameter culvert pipes set in concrete foundations. Friez FW-1 stage recorders are placed at the top of the well in small gage houses.

The procedure used for developing the hydrograph from the rate of change of stage in the reservoir is similar to that described by Minshall(2).* Since the procedure is sensitive to reservoir geometry, surveys of the storage area are made periodically. A special effort is made to secure surveys after intense storms. If several heavy rains occur within a few days, an interpolation between stage-storage curves may be necessary.

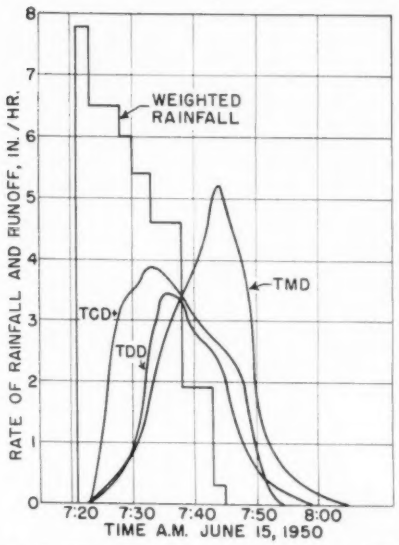

Fig. 3 Rainfall histogram and hydrographs for a 1950 storm in the Theobold watershed after a heavy antecedent rainfall

The dams and spillways used to facilitate the runoff measurements are a part of the construction carried out under the United States Department of Agriculture's Little Sioux Flood Prevention Program(1).

Recorded Intense Storms

Three very intense storms were recorded on the described watersheds during the period of record. On June 15, 1950, and June 13, 1957, 15-min rainfalls of 1.70 in. and

*Numbers in parentheses refer to the appended references.

TABLE 2. SUMMARY OF STORMS

	Nepper Watersheds				Theobold Watersheds					
	Storm—June 17, 1951				Storm—June 15, 1950			Storm—June 13, 1957		
	N-SW-D	NMD	NMO		TDD	TCD	TMD	TDD	TCD	TMD
1 Cropping										
Row crop, percent	100	34	32		32	51	39	45	37	27
Small grain, percent	0	25	32		36	25	34	0	4	20
Hayland and pasture, percent	0	33	19		32	22	29	55*	54*	45*
2 Peak flow, iph	4.4	4.6	4.1		3.5	3.9	5.2	5.4	5.6	4.0
cfs	212	574	734		219	588	1616	339	856	1229†
3 Total weighted rainfall, in.	4.91	4.80	4.93		2.19	1.77	1.69	2.67	2.13	2.62
4 Runoff, in.	3.05	2.76	2.75		0.88	1.29	1.32	1.55	1.36	1.33
5 Rainfall frequency duration	(Gage N-2)				(Gage T-3)			(Gage T-3)		
	10 min	15 min	30 min	60 min	10 min	15 min	30 min	10 min	15 min	30 min
Recurrence interval, years	25	50	100	>100	50	90	30	90	100	25
6 Rainfall total at central gage in sequence which rainfall occurred, in.	1.10	1.60	2.85	4.14	1.24	1.70	2.17	1.33	1.80	2.10
7 Antecedent rainfall	0.20 in. on June 9 0.45 in. on June 7				0.70 in. on June 14 3.40 in. on June 12 0.70 in. on June 2			0.22 in. on June 7 0.15 in. on May 25 1.24 in. on May 21		

*Soil bank land area equaled 46, 37 and 19 percent, respectively.
†Trash on highway culvert caused ponding.

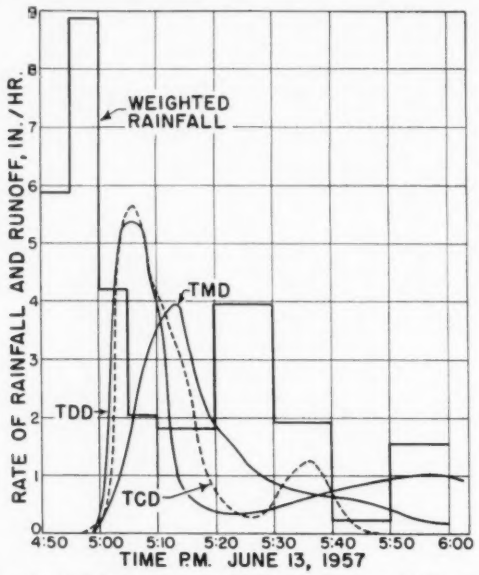

Fig. 4 Rainfall histogram and hydrographs for a 1957 storm in the Theobold watershed after a light antecedent rainfall

1.80 in., respectively, fell on the Theobold Watersheds. On June 17, 1951, a 90-min weighted rainfall of 4.90 in. fell on the Nepper Watersheds. The latter rain had a probable frequency of occurrence of less than once in 100 years according to the United States Weather Bureau(3). A summary of the storms is presented in Table 2.

The 1950 storm (Fig. 3) on the Theobold Watersheds occurred after heavy antecedent rainfall. The weighted rainfall histogram for the storm reveals an advanced pattern. However, the intensity of rainfall varied considerably over the watersheds as shown by the weighted rainfall for the individual watersheds. The maximum relative intensity was measured at T-3 where 1.70 in. fell in 15 min.

The fact that the hydrograph from TDD, a watershed of 63 acres, peaked later than the hydrograph from TCD, a watershed of 151 acres, can be explained at least in part. The form factor for TCD is 0.76; the form factor for TDD is 0.38. Also, only 40 percent of the rainfall appeared as surface runoff from TDD while 73 percent of the rainfall on TCD was recorded as surface runoff. The latter fact was, no doubt, a primary factor in the delay in the time of rise on TDD. Two features in the watershed, which would contribute to reduced runoff, were the area of contour-listed corn and the area of lightly grazed bluegrass pasture. These areas covered 9 and 21 percent of the watershed respectively.

The 1957 storm (Fig. 4) on the Theobold Watersheds occurred after relatively light antecedent rainfall. The rainfall was extremely intense; gage T-3 recorded a 5-min intensity of 9.58 iph while the weighted rainfall of the gaged areas for this period was 8.90 iph. Again, the intensity varied over the area, the least intense rainfalls being gaged at T-1 and T-2.

Unusual peak discharges of from 3.5 to 5.6 iph were recorded in the two storms. The peak discharge at TMD was reduced in the 1957 storm by ponding at the road structure, which was designed for full flow. The nearby farmer indicated that most of the trash causing the ponding was cleared from the trash rack later in the storm; however, there was evidence that the water almost ran over the road.

The temporary storage in the three reservoirs in the Theobold Watersheds plus the increased channel storage resulting from the reduced channel grade considerably reduced the local peak flow on the main channel below the reservoirs. The discharge from the area above TMO, an area of 762 acres, was 407 and 270 cfs for the 1950 and 1957 storms, respectively.

The unusual storm of June 17, 1951, on the Nepper Watersheds occurred after a period of little rainfall (Table 2). Apparently the center of the storm passed over these watersheds since rain gages located 4 miles northeast and 5 miles south of the watersheds recorded a total catch of only about 3 in., while the total catch on the Nepper gages was about 4.90 in. (Table 2). The rainfall histogram shown in Fig. 5 is weighted and does not necessarily reflect the rainfall intensity for any one of the watersheds for which hydrographs are shown. The 3.05 in. of runoff for N-SW-D approached the design runoff, 3.17 in., used at the time of construction of the dams. Although 15 percent of Watershed N-SW-D was terraced, it produced the greatest volume of runoff largely because the area was all in corn. Also, some of the terraces were undermined as a result of rodent activity, a common problem in this area of level terraces. Since the average infiltration rate for this storm was high, over 1.00 iph, and the reservoirs were designed with extra capacity for siltation, the emergency spillways did not function even though the storm exceeded the design storm in accumulated rainfall and intensity.

Although the physical features of the watershed above NMO are not here described, the hydrograph was included in Fig. 5 as an illustration of the effect of channel storage. Two small full-flow structures were constructed above the gaging station on two branches of the watershed, and the grade of the channel below NMD was reduced. Although the structures were not designed for storage, some runoff was temporarily stored because of the geometry of the channel above the structures. Thus the rise in the hydrograph for NMO was delayed although the peak eventually was nearly the same as on the other two watersheds.

The long duration and high intensity of the rain caused severe erosion. Nearly 3.5 acre-feet of sediment was de-

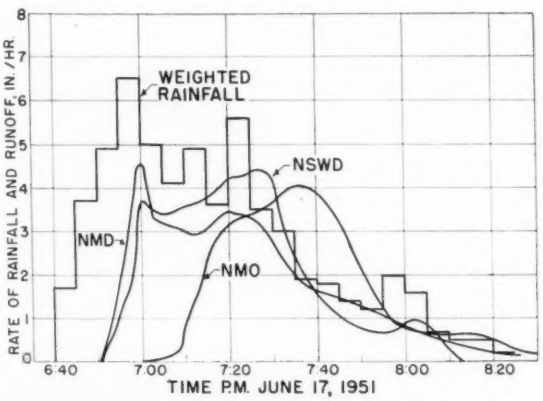

Fig. 5 An unusual storm occurred on June 17, 1951, in the Nepper watershed after a period of little rainfall

posited in NMD, which is approximately two-thirds of the storage volume lost to siltation during the first seven years after construction of the reservoir. About three-fourths of the storage volume lost to siltation in N-SW-D for the same period resulted from the storm.

Summary

Rainfall and runoff records taken during the growing season have been accumulated for a period of eight years on five agricultural watersheds located about 30 miles southeast of Sioux City, Iowa. The watersheds vary in size from 49 to 309 acres. The land slopes are steep, about one-half of the land having slopes greater than 10 percent. Most of the land is under cultivation, about one-third being in row crop, one-third in oats and one third in hay land or pasture.

Rainfall is measured with recording rain gages. Runoff is continuously recorded at reservoirs or at full-flow spillways.

The first objective of the study, that of securing design information, has been accomplished for the eight-year period. Very high peak rates of runoff from these agricultural watersheds were recorded. For these storms, the rates of runoff varied from 3.5 to 5.6 iph. The peak of over 1600 cfs from the 309-acre watershed is particularly high. The steep slopes, the steep channel grades, the well-defined drainage system and the lack of channel storage result in short times-to-peak on hydrographs. The second objective, that of determing the effect of structural treatment and land treatment, has been partially accomplished. Evidence of the reduction of flood peaks resulting from reservoir storage was accumulated. However, land conservation practices have not been adopted to a degree necessary to noticeably reduce peak flows or runoff. Plans are being made, pending landowner cooperation, to terrace one watershed in each of the two watershed areas in order that the effects of terracing on runoff may be measured.

References

1 Freyburger, Edwin. Flood control in the Little Sioux Watershed in Iowa. AGRICULTURAL ENGINEERING 32: 152-154. 1951.

2 Minshall, N. E. Method of determining runoff from areas above detention structures. USDA, Soil Conservation Service, 1949.

3 U.S. Department of Commerce, Weather Bureau. Rainfall intensity—duration—frequency curves. Technical Paper No. 25, 1955.

Part II Tractor Book Available

"DEVELOPMENT of the Agricultural Tractor in the United States," Part II, by R. B. Gray is now available. This edition is a complement to Part I which included an account of the early history of the agricultural tractor with brief specifications of many of the tractors produced by manufacturers of the steam traction engine and the gas tractor and discussed mechanical farm power from its beginning to 1920. Part II covers the period of history on the development of both wheel and track-type tractors from 1920 to 1950.

The first edition of Part I was printed in 1954 by the Agricultural Engineering Research Branch, Agricultural Research Service, U.S. Department of Agriculture. Because of a demand for additional copies and its historic value, the American Society of Agricultural Engineers sponsored a second printing of Part I in 1956. In order to make both editions available, ASAE has sponsored the first publication of Part II.

Mr. Gray is a retired head of the Division of Farm Machinery, Agricultural Research Service, USDA, and is nationally known for his experience in the development of farm mechanization. Part II has been written since Mr. Gray retired in 1954. He joined ASAE in 1920 and is now a Life Fellow.

Copies of both editions can be obtained from ASAE Headquarters, 420 Main St., St. Joseph, Mich., at $2.00 per copy for each part. A set consisting of both Part I and Part II is priced at $3.75.

. . . Efficiency in Combining

(Continued from page 20)

The overall rate of drying of the grain was 2.5 percent per day for Ohio conditions; however there are normally four days between 20 and 14 percent.

As wheat stands in the field after maturity the following occur:

(a) Test weight decreases at the rate of about 0.23 lb per bu per day.

(b) Germination reduces only slightly.

(c) Leaching and oxidation accounts for only about a 1.4 percent loss in dry matter in 20 days.

(d) There is no effect on milling and baking as long as the grain is handled well during and after harvest.

(e) When considering the combine method of harvest at various dates there is approximately 12 lb per acre per day less grain that the combine can harvest due to shatter or related losses.

In regard to high moisture harvest the recommendation must be to limit combining to 20 percent grain moisture or below in order to maintain high test weight, germination and storability.

When considering combine efficiency the following seems to be true:

(a) Cylinder loss increases as the moisture content increases; however, present combines have capability of threshing the grain.

(b) Rack loss seems lowest in an intermediate moisture range, 13 to 19 percent straw moisture.

(c) Shoe loss reduces as moisture content increases.

(d) The highest machine efficiency occurred between 15 and 20 percent grain moisture.

(e) It appears in terms of combine functioning that 20 percent grain moisture should be the maximum.

Cutterbar and shatter losses are reduced by early season and high-moisture harvest. Highest method efficiency was observed between 17 and 22 percent grain moisture during the period of grain maturation.

Both from the standpoint of method and machine efficiency slightly higher than normal combine moistures are advantageous. Grain from such a method of harvest potentially has better condition if handled and stored well.

References

1 McCuen, G. W and Silver, E. H. Combine harvester investigations. Bulletin 643, Ohio Agricultural Experiment Station, 1943.

2. Berg, Mans; Ottosson, Lemart; Aberg, Evert. Influence of combining on the quality of grain. Swedish Institute of Agricultural Engineering, Ultuna, Uppsala, Meddelande N:r 225, April 1949.

3 Lichti, R. W. Combine cylinder tests. Special Problem Report, Department of Agricultural Engineering, Ohio State University, August 1956.

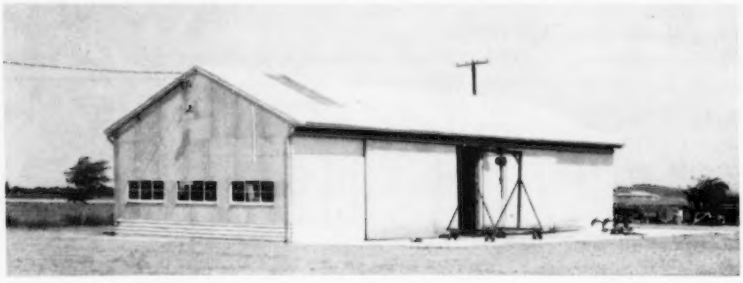

Fig. 1 A typical farm shop building. The legal requirements controlling its construction may be appropriate or may be unrealistic

Building Codes in Agriculture

E. P. Speck and S. A. Hart
Assoc. Member ASAE *Member ASAE*

Are agricultural building codes a help or hindrance? How can they best serve the farmer, his employees and the public?

A SERIOUS threat to economical farm construction exists in the form of some building codes. Three basic interests: urbanization of rural areas, demand for sanitary farm products, and the safety and welfare of the farm worker are the principal factors leading to the adoption of building codes. These interests as expressed in building codes make farm construction a complex, critical and changing problem.

In the state of California, several public agencies regulate agricultural construction. A study was made to determine who these agencies are, what their jurisdiction is, and what the future may hold in the way of regulation to farm construction. California's situation seems to be typical in that there are both areas where farming is essentially the only enterprise and areas where farming competes with urbanization and industry. Two major regulating powers were found. One comprises the 58 counties with their local building codes. The second is the state government.

County Regulations

County governments adopt building ordinances by action of their boards of supervisors. The purpose of most county codes is to regulate construction in unincorporated areas so as to prevent structural failure, eliminate fire hazards, and generally protect the health and welfare of the community. Exactly one-half of California's county governments have passed building ordinances. Their requirements range from minimal to extremely stringent and detailed.

Counties with ordinances or codes most frequently have adopted one or more of the so-called "uniform codes." The most popular are:

(a) The Uniform Building Code published by the Pacific Coast Building Officials Conference.

(b) The Uniform Plumbing Code published by the Western Plumbing Officials Association.

(c) The National Electric Code published by the National Fire Protection Association.

Paper presented at the 51st Annual Meeting of the American Society of Agricultural Engineers at Santa Barbara, Calif., June 1958, on a program arranged by the Farm Structures Division.

The authors — E. P. SPECK and S. A. HART — are, respectively, assistant director of field stations, and associate professor of agricultural engineering, University of California, Davis.

Besides these, some counties have adopted the Uniform Electrical Code of the Pacific Coast Electricians Bureau or the Electrical Safety Orders of the State of California. Ordinances adopting these codes usually contain a few amendments for easier application within the county. Five counties have adopted and published building codes and ordinances without reference to uniform codes. These ordinances vary from extremely sketchy regulations, designed merely to get the structure on the tax rolls, to detailed constructional requirements patterned after the uniform codes.

Twenty-three of the counties exempt farm construction from their building codes. When farm construction is exempted the usual reason is that the code was written primarily for urban non-farm construction problems, and farmer pressure has been able to force exemption. Farm building exemptions take several forms. The most common method is an exclusion by land area which exempts all buildings located on areas larger than a stated acreage (commonly 2½ to 5 acres). Another method is simply to exempt all agricultural buildings, after defining what an agricultural building is. In such case, farm dwellings usually must comply with all building codes. Still more exemptions are based on building size — usually applying to buildings that are less than 1000 square feet and are designated as accessory buildings.

Most counties permit, but do not require, farmers to secure building permits and obtain the services of the building inspector. When this is done the building must conform to the county ordinances, so the provision is seldom used by farmers.

The 29 counties which do not have building codes are predominantly agricultural areas and are remote from intense urbanization pressures.

The fact that county building codes are not generally applicable to farm construction is significant and serious. The reason that county codes are not appropriate can be seen from an analysis of the uniform codes, the basis of most county ordinances. The Uniform Building Code clearly states that it "is dedicated to the development . . . of a sound economic basis for the future growth of the cities." It contains minor references to agricultural buildings, but

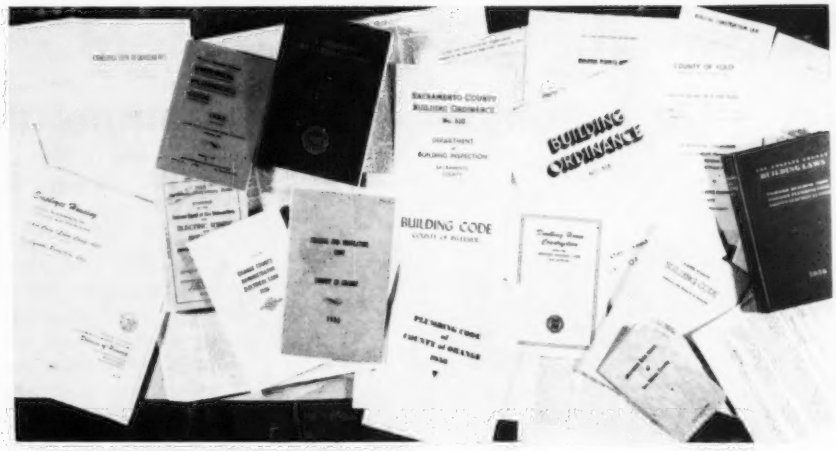

Fig. 2 Farm construction is — or may be — subject to legal restrictions such as these

these are so ambiguous and incomplete as to make application difficult. For instance, a farm shop would appear to qualify as a farm building. Yet a strict interpretation of the building code would classify it as equivalent to a repair garage. Under this classification it could be required to have exterior walls of one-hour fire resistivity (obtained by solid brick, concrete block, or wood studs with gypsum board on both sides as well as exterior sheet metal or siding). It would also have to have windows and skylights equal to one-eighth of the total floor area, one-half of which must open for ventilation, or it would have to have a mechanical ventilation system. A toilet is mandatory, and an automatic fire extinguisher system could be required. Since the farm shop is only an aid to the farming operation rather than a prime place of business, such requirements seem excessive.

Similarly, the Uniform Plumbing Code contains sections not well suited to farm building construction. For instance, the definition of a "building" requires agricultural structures to conform to the same regulations as dwellings and industrial buildings. Section 1.11 of this code states that work is to be done only by persons holding plumbing licenses, in effect prohibiting the farmers from doing the work on his own farm buildings; yet this section does allow him to plumb his own home which is usually more complicated than his agricultural building.

The National Electric Code is a compendium of good electrical practice, designed to safeguard both the building and those who use it. It was written for adoption by local governments, but its contents show more concern for industrial problems than agricultural problems.

There are "County Zoning Ordinances" that specify land area usage. These may interfere with agricultural construction, but since their purpose is to control farm operations (such as hog or chicken raising) rather than farm building, they are not discussed in this paper.

State Regulations

Various state agencies have jurisdiction of one type or another over farm construction. The State Departments of Agriculture, Industrial Relations, and Public Health are the most important. Within these departments are several divisions charged with specific responsibilities.

The Department of Agriculture's interest in farm buildings arises from a responsibility for sanitary farm products. Departmental regulations pertain to dairy barns, grain storage, slaughter houses, and animal feeding methods. In general, these rules deal with the arrangements of buildings and the constructional features necessary to ensure good sanitation. The dairy barn regulations are an example. Before 1938 each milkshed had its own requirements on milking practices, structures and their arrangements, equipment and farming practices. The dairyman found it nearly impossible to change his milk sales contract. At the request of farmers the State Department of Agriculture stepped in and, after extensive public hearings, wrote a set of minimum standards for milking barns. These standards are applied statewide and have brought order to an unmanageable situation, have upgraded the purity of the milk, and have helped the farming operations.

The Department of Industrial Relations is concerned with the safety and welfare of the employee. It has three major divisions charged with different areas of regulation. The Division of Industrial Safety is concerned with safe places of employment. This Division publishes Safety Orders that are, in effect, law, and apply wherever persons are employed. Some of the safety orders with direct application to agricultural buildings regulate electrical construction, petroleum gas fuel storage and use, pressure vessels (air compressors, etc.), and general industry (guarding of machinery and stairways, working near power lines, etc.).

The Division of Housing regulates labor camps and some of the other employee housing furnished by employers. It specifies such things as toilet and sanitary facilities, camp layout, building design, and group sleeping, kitchen, and eating facilities. The Earthquake Protection Law (Riley Act) is also administered by the Division of Housing. This act, which sets very minimum standards of construction to resist seismic loadings, is applied to most farm buildings when not covered by county ordinances.

The Division of Industrial Welfare is concerned with regulations where women are employed. Such things as sanitary facilities, drinking water, washing facilities, ventilation, lighting and materials handling are under this division's jurisdiction. These regulations may not apply on every farm, but where they do, the requirements are explicit and demanding.

The State Department of Public Health has regulations controlling domestic water systems that distribute to two or more places of habitation. *(Continued on page 34)*

A Switching Arrangement

for Automatic, Remote Temperature Recording

Richard A. Schleusener
Assoc. Member ASAE

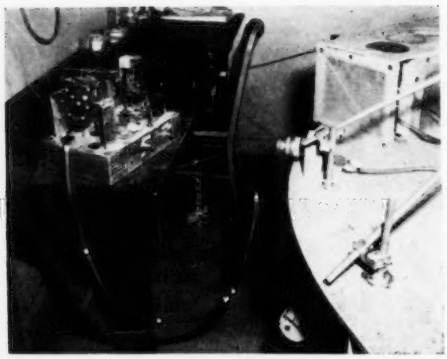

Fig. 1 Thermocouple leads from turntable connected through amphenol plugs to stepping relay

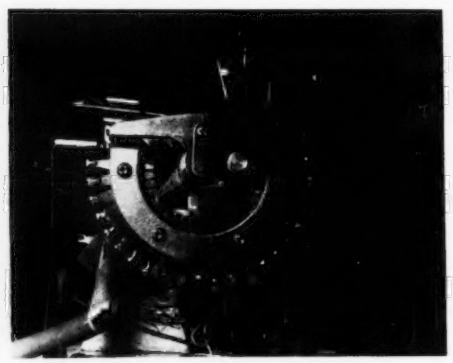

Fig. 2 Close-up of stepping relay

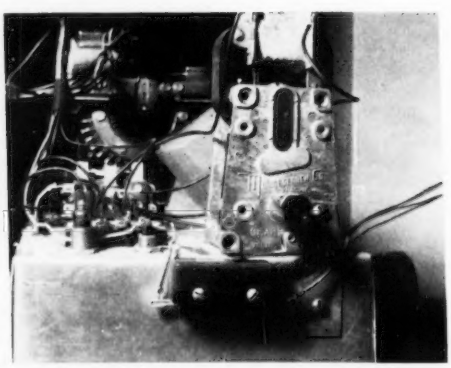

Fig. 3 View of motor-driven cam that provides the timed impulse to the stepping relay

A SIMPLE arrangement for automatic recording of temperatures with the recorder physically removed from the test equipment has been devised in conjunction with a study of evaporation from soils.* The arrangement utilizes a stepping relay to permit recording of temperatures from 18 locations with a pen-dragging recording potentiometer. The arrangement can be adapted to an unlimited number of thermocouples and is suitable for use in any application requiring automatic recording of temperatures from a remote location.

The use of stepping switches for remote control of temperature recording apparatus has been described by Puckett (2)†. Their use for increasing the latitude of a recording potentiometer has been described by Hansen and Hall (1). The system described here differs from those described previously in that an electromechanical device is used to provide the impulse for the advance of the stepping relay and only a single-point recorder is utilized. In addition, the circuit can be used to provide either a single or continuous record of temperatures for each thermocouple connected through the stepping relay to the recorder.

Thermocouple leads from a soil column on a turntable were connected through a pair of amphenol plugs to a stepping relay‡, and thence to the recorder§. Fig. 1 shows the plugs and the stepping relay. The stepping relay connected each thermocouple in turn to the recorder. The circuit was arranged to stop automatically after a record had been obtained from each thermocouple in one column. The male emphenol plug was then connected to the next column, and the process was repeated. The stepping relay could be made to return rapidly to a *home* position at any time. The chart drive mechanism on the recorder was connected so as to move the paper on the recorder only while temperature measurements were being made. With the turntable arrangement as shown in Fig. 1 only 18 thermocouple pairs could be connected through the amphenol plugs. For other applications not requiring the use of the plugs, up to 52 points (or more) can be used on each switching level. Use of multiple-level stepping relays would permit auto-

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*Colorado contributing project to Western Regional Project W-32, "Basic Hydrologic Factors Relating to Water Conservation."

†Numbers in parentheses refer to the appended references.

‡Type 20, SD-42, double bank stepping relay, available from C. P. Clare and Co., 3101 West Pratt Blvd., Chicago 45, Ill.

§Minneapolis-Honeywell Regulator Co., Brown Instruments Division, Type 153, Electronik Recorder.

An "Instrument News" contribution. INSTRUMENT NEWS (Karl Norris, Editor) is sponsored by the ASAE Committee on Instrumentation and Controls. Articles on agricultural applications of instruments and controls and related problems are invited and should be submitted direct to K. H. Norris, 105A South Wing, Administration Bldg., Plant Industry Station, Beltsville, Md.

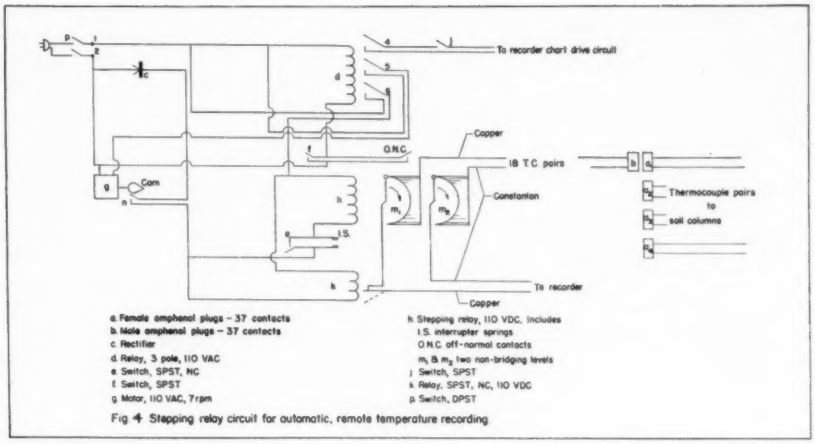


Fig 4 Stepping relay circuit for automatic, remote temperature recording

Fig. 4 Stepping relay circuit for automatic, remote temperature recording

matic recording of temperatures from an unlimited number of thermocouples.

A close-up view of the stepping relay is shown in Fig. 2. A view of the cam that provides the timed impulse for the stepping switch is shown in Fig. 3. Details of the circuit for the stepping relay may be obtained from the wiring diagram as shown in Fig. 4.

The stepping relay is started by closing switch *p* and then depressing the starting switch *f*. Current then flows through the starting switch *f* from terminals 1 and 2 to operate relay *d*. Closure of relay *d* permits current to flow through branch *d*-5 of the relay to the motor *g*. In addition, closure of relay *d* brings current from the rectifier *c* through branch *d*-6 to relays *h* and *k* during the times that microswitch *n* is closed. The timed impulse that advances the stepping relay is provided by the motor *g* which drives a cam that actuates the microswitch *n*. Closure of *n* allows current to flow from the rectifier through branch *d*-6 to operate the stepping relay *h* and relay *k*. Variation in the timed impulses can be provided by varying the cam shape or motor speed. After the cam first actuates the microswitch *n* so the stepping relay *h* steps off the *home* position, the off-normal contact springs (O.N.C.) are closed. Since the off-normal contacts are closed in every position of the stepping relay except the *home* position, the stepping relay continues to advance one step at a time with each closure of microswitch *n* by the motor-driven cam.

The circuit through branch *d*-6 that operates the stepping relay *h* is taken through the interrupter springs (I.S.), so that the stepping relay would act in a self-interrupted (doorbell) fashion if it were not for by-passing the interrupter springs by the normally closed switch *e*. With the switch *e* closed the stepping relay advances only one step at a time with each closure of microswitch *n*. Opening switch *e* permits the stepping relay to act in a self-interrupted fashion until the stepping relay reaches *home* position. At the *home* position the off-normal contacts open and the switch stops.

The stepping relay reaches the *home* position after moving through 180 deg of arc, either in a step-by-step or self-interrupted fashion. At the *home* position the off-normal contacts open, stopping flow of current to relay *d*. When relay *d* opens, current is cut off to branches *d*-4, *d*-5, and *d*-6. Opening branch *d*-4 stops the recorder chart. Opening branch *d*-5 stops the motor *g*. Opening branch *d*-6 cuts off power from the rectifier to the stepping relay.

Branch *d*-4 controls the circuit that stops and starts the paper motion on the recorder. The stepping relay may be operated without paper motion on the recorder by opening switch *j*.

Normally closed relay *k* opens when the cam closes microswitch *n*. Relay *k* is placed in the thermocouple line to the recorder to give a *break* in the signal to the recorder to distinguish between records from adjacent thermocouples.

Continuous operation may be provided by placing a jumper across the off-normal contacts.

The switching arrangement has been in use for over 18 months and has given highly satisfactory service. The saving in time as compared to a manual switching arrangement has been considerable.

References

1 Hansen, C. M. and Hall, Carl W. A method of increasing the latitude of a recording potentiometer. AGRICULTURAL ENGINEERING 33, 11:718, November 1952.

2 Puckett, H. B. Temperature measurement by remote control. AGRICULTURAL ENGINEERING 38, 4:242-43, April 1957.

Consulting Agricultural Engineers

MEMBERS of ASAE who are employed as consulting agricultural engineers or wish to be listed as such in the "Consulting Agricultural Engineers" section of the 1959 AGRICULTURAL ENGINEERS YEARBOOK (See pages 144 and 145, 1958 edition) are urged to supply the necessary information by February 1, 1959.

All that is required to be listed is to furnish: complete name and address, a brief description of consulting services (not to exceed 50 words), specify whether registered professional engineer, and list specialty by division interest; such as, Power and Machinery, Farm Structures, Electric Power and Processing, and Soil and Water. Those whose services extend beyond one division may be listed accordingly. Send the above information to the attention of J. Basselman, Editor, AGRICULTURAL ENGINEERS YEARBOOK, 420 Main St., St. Joseph, Mich.

. . . Building Codes

(Continued from page 31)

With few exceptions state regulations are not a serious economic handicap to farm construction. Most regulations which directly affect agriculture were subject to open public hearings in agricultural areas before adoption.

Codes — Pro and Con

From a farmer's point of view, building codes are a mass of red tape hampering the operation of his farm, complex and difficult to understand and possibly impossible to conform to. He feels the codes will increase construction cost and make it more expensive to add new facilities or alter existing structures. He is also aware that superior structures are likely to be assessed at a higher value, increasing his tax load. The farmer may consider these points as justification for agricultural exemptions to building codes, but in his own interests he should favor the adoption of realistic building codes. The trend in farm ownership toward commercialization of farming indicates that a larger share of farm building will be done under contract. Unless there are existing codes or regulations to serve as a guide, the farmer will find it necessary to have complete detailed plans and specifications prepared for all construction. If the code is sound it should be able to serve the farmer as a guide from which durable, serviceable, safe, and efficient buildings can be constructed with reasonable economy. Conformity to regulations often attracts a higher quality of farm labor by furnishing better living and working conditions.

One must also consider agricultural building codes from the standpoint of the public. There are some disadvantages to regulation. The cost of administration must be considered, and such ordinances would add to an already complex situation. These disadvantages are greatly overshadowed by the many advantages. Through building codes and regulations, public agencies can require safe and healthful working conditions that will be effective in reducing worker accident rates. Good housing and sanitary facilities help maintain the health of employees. Sanitary farm products are important to the farmer and the public alike, and good building codes promote conditions favoring sanitary products. Fire hazards are reduced in building up to code, thereby lowering the danger to other properties.

Cure for Common Code

We have described the different regulations now affecting agricultural construction, and discussed the merits and disadvantages of such regulation. The trend appears to be toward still more regulation as urbanization, sanitary demands, and worker protection pressures become more intense. Forces demanding the adoption of codes in the highly populated rural areas are politically potent, therefore farming interests are advised to press for ordinances and codes that are reasonable and realistic rather than oppose any form of regulations.

The question is, what is a reasonable code that takes into account the farmer's problems as well as the interests of the employee and the public? We believe reasonable codes at county and state levels would recognize the following facts:

1 Farm buildings have a lower use than similar industrial buildings. Farm buildings usually house less valuable commodities. Therefore a lower requirement in the classification of occupancy would appear warranted.

2 A building code cognizant of agricultural problems would recognize that space, both inside the farm building and around it, is not at the premium that it is in urban areas. The code would make greater use of space as a method of obtaining safety and fire protection.

3 The structural code would permit loadings to have greater deflections than is usual for urban codes. The allowable flexural, shear, and compressive stresses would be kept to existing codes.

4 Wind pressure and roof live loads would be designed to meet actual conditions. Because farm exposures are more severe, wind loading requirements might be higher than in urban codes.

5 Safety orders in existence today are primarily for industrial conditions where exposures to hazards are continuous and intense. Some relaxation could be considered, because of the lower use conditions of agricultural buildings.

6 Codes would specify the workmanship but not the worker. The farmer, his employees, or his contractor would be permitted to do any construction as long as it was done satisfactorily and in fulfillment of the approved plans.

7 Codes would never be used as a method of restricting any farming operations. Any structural plan shown to be adequate in strength, sanitation and safety would be permitted.

8 Though many agencies will continue to be concerned with agricultural buildings, unnecessary duplication and overlapping of authority should be eliminated. Local administrators should maintain a reference book containing all regulations that apply to farm construction.

9 Pre-fabricated construction, or "package buildings," would be designed by the manufacturer to meet the code, and would be permitted on the farm without red tape.

10 Agricultural engineers are in a position to know both farm problems and the requirements for sound and safe buildings. Their services should be used in the preparation, and interpretation of codes for agricultural construction.

1959 Nuclear Congress

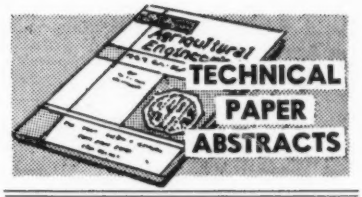
DETAILS of the 1959 Nuclear Congress have been announced by the Engineers Joint Council. Forty sessions are to be held during the five-day congress which begins April 5 at the Public Auditorium in Cleveland, Ohio.

Features of the meeting will be engineering papers dealing with advances in reactor technology and the use of radioactive materials, a trade show, the ATOMFAIR, talks devoted to problems of industrial management in the nuclear field and papers devoted to laboratory problems in radioactive materials.

Theme of the congress, which will be sponsored by more than 30 leading engineering, scientific and management groups, including the American Society of Agricultural Engineers, is "For Mankind's Progress." Copies of the program will be available from ASAE, 420 Main St., St. Joseph, Mich., in February.

The announcement noted that invitations had been issued to Russian engineers to describe details of their power reactor program, including a 600,000 kilowatt power plant reported to be under construction in Siberia. Other speakers will include specialists from England, France and Italy.

Following are brief reviews of papers presented at ASAE meetings or other agricultural engineering papers of which complete copies are available. ASAE members may obtain copies of these papers without charge by returning order forms supplied to each member upon payment of membership dues. Non-members, and members requesting more than 10 copies, may obtain copies at 50 cents per copy to cover carrying charges from the American Society of Agricultural Engineers, St. Joseph, Mich.



Air Cooled Engines for Agricultural Applications, by F. W. Lohmann, vice-president, Diesel Energy Corp., New York, N. Y. Presented at the North Atlantic Section Meeting, Guelph, Ontario, Canada, August 1958. **Paper No. 58-308.**

The application of air-cooled diesel engines to agricultural equipment is outlined in this paper. The author points out certain advantages inherent in this type of design, particularly freedom from cooling system problems and a reduction in the warm-up period.

Water Intake Rates of Shelby-Grundy Soils from Hydrograph Analyses, by V. C. Jamison and J. F. Thornton, respectively, soil scientist and agricultural engineer, ARS, USDA, University of Missouri, Columbia. Paper presented at the Winter Meeting of ASAE in Chicago, December 1958, on a program arranged by the Soil and Water Division. Paper No. **58-501.**

This paper is a report on twelve storms selected from the Bethany SCS Experiment Station records, chosen as suitable for hydrograph analyses for soil intake rates by the method of Sharp and Holton. The studies cover intake rates in relationship to soil moisture and protective cover. Intake rates from the analyses show that moisture absorption by Shelby and Grundy soils depends more on antecedent moisture content than soil cover or management practice.

Summary of New Chemicals and Application Techniques for Southern Crops, by O. B. Wooten, agricultural engineer, (BPISAE), USDA, and Mississippi Agricultural Experiment Station, Delta Branch, Stoneville. Paper presented at the Winter Meeting of ASAE in Chicago, December 1958, on a program arranged by the Power and Machinery Division. Paper No. **58-609.**

This manuscript describes the progress made in farming in the South within the last 10 years with the use of chemical fertilizers, herbicides, insecticides and defoliants. As an example the author cites the use of anhydrous ammonia, a highly concentrated nitrogenous material used during World War II when solid nitrogen fertilizers were in short supply, as having saved Mississippi farmers alone more than 20 million dollars during the first 10 years in which it was used. He concludes his summary with the assurance that the future of agricultural chemicals will be bright in the South, as well as in the rest of the country.

Grain Ventilation and Drying Patterns, by Norton C. Ives, W. V. Hukill and R. A. Saul, respectively, agricultural engineer, and head, Grain Harvesting and Drying Section, Harvesting and Farm Processing Branch, AERD, ARS, USDA; and agricultural engineer, Livestock Engineering and Farm Structures Research Branch, AERD, ARS, USDA. Paper presented at the Winter Meeting of ASAE in Chicago, December 1958, on a program arranged by the Farm Structures Division. Paper No. **58-701.**

These studies reveal that in a non-linear air flow system a distorted or curved drying front develops with leading and lagging portions, and that the most retarded portion of this drying front in a non-linear system lags behind a horizontal drying front of an equivalent parallel flow system by a distance equal to approximately ½ of the duct or air opening center to center spacing. A simple formula is presented for predicting the increased amount of drying air required for a duct system over that which would be required for an equivalent parallel flow system. Also a method is presented to predict the increase in static pressure required to provide the necessary increase in the air flow rate to maintain equivalent drying performance of the two systems.

Minimum Tillage — Its Effect on Soil Physical Properties and Crop Responses, by A. A. Swamy Rao, R. C. Hay and H. P. Bateman, respectively, former graduate research assistant, professor and assistant professor of agricultural engineering, University of Illinois, Urbana. Paper presented at the Annual Meeting of ASAE, on a program arranged by the Soil and Water Division. Paper No. **58-500.**

This paper presents results during one year of a project involving a comparative study of minimum tillage and conventional tillage with respect to soil physical properties and crop responses undertaken by the Agricultural Engineering Department of the University of Illinois in 1957. A thorough review of literature was carried out in order that experiments could be conducted in the light of work done in this field during the past years. Altogether, 172 articles were reviewed covering the period from 1925 to 1958. The tillage method used consisted of plowing and planting in the wheel track made by a special press wheel.

Streambank Stabilization, by Leon F. Silberberger, state conservation engineer, Soil Conservation Service, Durham, New Hampshire. Paper presented at the Winter Meeting of the ASAE in Chicago, December 1958, on a program arranged by the Soil and Water Division. Paper No. **58-503.**

This paper describes the major streambank control measures which are being carried out on the Buffalo Creek Watershed under the United States Department of Agriculture by the Soil Conservation Service. The riprap revetment work, concrete sills, and the role vegetation takes in the control measures are also considered. Sketches are included to show installation of control measures.

Research on Electro-Reclamation of Saline-Alkali Soils, by Harold J. Gibbs, head, Special Investigation and Research Section, Earth Laboratory Branch, U.S. Bureau of Reclamation, Denver, Colo. Paper presented at the Winter Meeting of ASAE, on a program arranged by the Electric Power and Processing Division. Paper No. **58-800.**

This study was made by large-size model tests under controlled conditions and made to resemble a field situation. The results are interesting and the tests large enough to show trends of changes attributed to the electrical treatment. These were in a favorable direction showing encouragement in the exchange reaction of sodium by calcium. Although electrical treatment assisted in the removal of salts and improved the reactions, it is apparent that leaching and drainage are very important in carrying the salts away. The effectiveness of the process over large field areas must be given careful consideration in analyzing its potential worth and it is believed that these laboratory studies will assist in comparing the process to other commonly used methods of treatment.

Liquid Manure — A Trend in the Midwest, by D. G. Jedele, assistant professor, agricultural engineering department, University of Illinois, Urbana. Paper presented at the Winter Meeting of ASAE in Chicago, December 1958, on a program arranged by the Farm Structures Division. Paper No. **58-703.**

The author of this paper considers the economics of liquid manure, equipment and management relative to the finishing floor, cleaning methods, and collection tanks. In evaluating the prospects for a wider use of liquid manure, the author states that at this time it appears that its collection from beef and dairy cattle lots will not become too popular. But in the hog enterprise, where liquid manure is a good solution to a difficult farm materials-handling problem, it promises to be put to greater use.

New Machines and Application Techniques for Northern Farms, by Wesley W. Gunkel, associate professor, agricultural engineering, Cornell University. Paper presented at the Winter Meeting of ASAE, December 1958, on a program arranged by the Power and Machinery Division. Paper No. **58-610.**

Pest control problems peculiar to orchard, vineyard, shade tree, row crop and field spraying are described in this paper. Different types of commercial equipment used to overcome these difficulties and advantages and limitations of this equipment are also discussed.

Progress in Aircraft Application Research in the United States and Abroad, by Norman B. Akesson and Wesley E. Yates, respectively, associate and assistant agricultural engineer, University of California, Davis. Paper presented at the Winter Meeting of ASAE in Chicago, December 1958, on a program arranged by the Power and Machinery Division. Paper No. **58-612.**

In discussing research in aircraft in the application of chemicals, the authors state that for large-scale field applications the aircraft is fast becoming the accepted means of application the world over. The paper reviews the latest developments in the field and describes the aircraft research work that is being done in the United States and other countries throughout the world.

Dairy Plant Management, by Paul H. Tracy, George D. Amerding, and Harold W. Hannah. Cloth, 6 x 9¼ inches, x+439 pages. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. $8.50.

This publication was written primarily for college students majoring in dairy technology, and for those in industry who may wish to prepare themselves for advancement in the field of dairy plant management. The authors present a discussion of problems and practices involved from the time a decision is made to purchase land and construct a plant on through the various stages such as purchasing equipment, employing a staff, purchasing and processing milk, selling, and handling the various governmental and legal problems with which the milk industry is involved. Major emphasis is placed upon labor relations, business management, business law, and plant efficiency.

Farm Housing, by Glenn H. Beyer and J. Hugh Rose. Cloth, 6¼ x 9¼ inches, xi +194 pages. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $6.00.

This book focuses on the shelter aspects of the farming population. Drawing from recent census materials for their data, the authors provide a complete compendium of facts and figures on the farmhouse and household in the United States in 1950—analyzing thoroughly the relationship of farm housing quality to other housing characteristics, and to the characteristics of their occupants.

An analysis of the recent impact of urban influences on farm housing is also given with an overall picture of farm houses occupied by non-white families.

Land: The 1958 Yearbook of Agriculture, the United States Department of Agriculture. Cloth. 6 x 8¼ inches, xi + 605 pages. Illustrated and indexed. Published by the United States Government Printing Office, for sale by the Superintendent of Documents, Washington 25, D.C. $2.25.

This book considers the land that was here when the colonists came, its importance in our history and growth, the use and management of public and private lands, the income and valuation of land, resources and prospective needs, and emerging problems of ownership and control. The changes brought on by these latter days and their relation to our land resources is also discussed. The text is preceded by 48 pages devoted to a pictorial review of the land including an account of what the pioneers found, the winning of the West, the growth of people and the nation, the development of scientific agriculture, problems of this later day, and what of the future? Chapter headings take in our heritage of land; how we use and manage public lands; how we use our private lands; some financial aspects of land use; rights, ownership, and tenure; taking care of what we have; our woods and templed hills; these also are our country; our growing needs and problems, and planning for a better use.

Hydrology for Engineers, by Ray K. Linsley, Jr., Max A. Kohler and Joseph L. H. Paulhus. Cloth. 6¼ x 8¼ inches, xv + 340 pages. Indexed and illustrated. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. $8.00.

This book presents the background theory and the specific techniques of engineering hydrology in simple, readable terms. It provides a sound theoretical background in hydrology and, at the same time, emphasizes practical, well-tested methods for the application of hydrology in engineering. Techniques are stressed which utilize correlation methods and eliminate judgment to the maximum possible extent. It limits its scope to those aspects of hydrology which concerns the engineer. Discussions have been simplified for use at an elementary level but generous references are given for further study.

Refrigeration and Air Conditioning, by W. F. Stoecker. Cloth. 6¼ x 8½ inches, vii + 397 pages. Indexed and illustrated. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. $8.00.

This book carries the analytical approach of refrigeration and air conditioning another step forward. Emphasis is on the modern concept of the subject as a synthesis of the fundamentals of thermodynamics, heat transfer, and fluid mechanics. While the commercially important vapor-compression cycle is emphasized, special types of refrigeration systems are treated concisely. Principles of heat transfer are incorporated to analyze the performance of actual equipment. A unified treatment of heat- and mass-transfer explains the characteristics of heat-transfer devices used for air conditioning.

The Presentation of Technical Information, by Reginald O. Kapp. Cloth. 5 x 7½ inches, xi + 147 pages. Indexed. Published by The MacMillan Co., 60 Fifth Ave., New York 11, N. Y. $2.95.

This is a writing guide to aid in the preparation of technical information accurately, clearly and economically — stressing the importance of presenting the information in an imaginative and free-flowing style. The author dissects, in crisp and amusing fashion, some classic "bad examples" of technical writing. Of great interest are his specific pointers for better writing. These include the use of repetition, breathing spells, metaphor, bridges of logical reasoning and the proper application of qualifying statements.

Farm Welding: Arc and Oxyacetylene Welding, by Marvin M. Parker. Third edition. Cloth. 6¼ x 8¼ inches, x + 262 pages. Illustrated and indexed. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y.

This book was prepared with the aim of providing the student with the necessary technical and practical information he will need to know in order to do the welding jobs commonly done in the farm shop. Emphasis is placed on correct welding procedures with the basic principles explained so that the student can develop an understanding of the welding process with which he is working. Special effort has been made to anticipate the difficulties commonly encountered by the inexperienced welder and to explain the cause and show how to recognize and avoid the difficulties in words common to those who will be using the book. It is written primarily for vocational agriculture students, farmers, and rural out-of-school groups and is intended to be used as a text in welding and to explain how it is used on the farm.

Arc Welding in Machinery Design and Manufacture, The James F. Lincoln Arc Welding Foundation. Cloth. 6 x 8 inches, xiii + 209 pages. Indexed and illustrated. Copies may be ordered from The James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio. $2.00 in U.S.A. $2.50 elsewhere.

A book of ideas for the efficient use of steel in machine design and manufacture. Part I contains suggestions, check lists and guides for designing better machines at lower costs. Part II contains reviews of 73 machine designs to illustrate how welded steel is used to solve problems of design and manufacturing.

The following books have been released recently by the Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y.

Polyamide Resins, by Donald E. Floyd. Cloth. 5¼ x 7½, viii + 230 pages. Indexed and illustrated. $4.50.

Polyurethanes, by Bernard A. Dombrow. Cloth. 5¼ x 7½ inches, ix + 176 pages. Indexed and illustrated. $4.50.

Plastic Sheet Forming, Robert L. Butzko. Cloth. 5¼ x 7½ inches, viii + 181 pages. Indexed and illustrated. $4.50.

Cellulosics, by Walter D. Paist. Cloth. 5¼ x 7½ inches, xi + 270 pages. Indexed and illustrated. $5.75.

Fluorocarbons, by Merritt A. Rudner. Cloth. 5¼ x 7½ inches, xi + 270 pages. Indexed and illustrated. $5.75.

Hanna's Handbook of Agricultural Chemicals. 489 pages. May be obtained by writing to Lester W. Hanna, Agricultural Enterprises, Route 1, Box 210, Forest Grove, Oregon. $5.95.

This book gives the uses of all agricultural chemicals, their toxicity to plants, animals and human beings and also gives antidotes in case of accidental poisoning.

American Agriculture: Geography, Resources, Conservation, by Edward Higbee. Cloth. 6 x 9 inches, x + 399 pages, illustrated and indexed. Published by John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $7.95.

This book is designed to bring the reader a panoramic view of agricultural land use in the United States, and is based on actual field observations and upon the literature of the Agricultural Experiment Stations of 48 states. It surveys the rural landscape and its physical resources — land, water, soil, climate. It offers a comprehensive record of the diverse patterns of land use as they appear on representative farms and ranches across the nation.

The author examines and defines the character of America's agricultural regions, explaining their patterns and analyzing their favorable and unfavorable resource endowments. The basic distinctions between the farming systems of the arid West and humid East are fully treated. Many illustrations in the form of maps, charts, and field plans are presented to demonstrate in a vivid manner the logic of good resource management.

Wins Scholarship

A. J. Rhodes (right), ASAE member and rural service consultant, Louisiana Power & Light Co., presents Bill Gary Lambert, ASAE student branch member, with a $300 check, one of the annual scholarships awarded by the company to six outstanding students in the College of Agriculture, Louisiana State University. One scholarship is to be given each year to a student of agricultural engineering. Bill had the second highest average in the sophomore class in both agriculture and agricultural engineering.

Elected to Board of Directors American Grassland Council

M. H. Barton, of the product research department of Deere and Co. and ASAE representative, has received the honor of being elected to the Board of Directors of the American Grassland Council. The election took place at the annual business meeting of the council held November 28 at Chicago, Ill.

Doctoral Program at API

A doctoral program leading to the Ph.D. Degree for agricultural engineers has been approved at the Alabama Polytechnic Institute, according to a report from F. A. Kummer, head of agricultural engineering department. In approving the program, the Council of Deans gave recognition to the fact that the profession of agricultural engineering has expanded rapidly during the past 25 years because of public awareness of the many technical problems confronting agriculture in the fields of soil and water management, farm mechanization, and automation applied to farm operations.

The doctoral program will be offered in two fields — soil and water management and power and machinery. Course offerings are to include broad training in such fields as mathematics, engineering, physics, and the biological sciences.

The advanced program for agricultural engineering is said to be based on a definite need for such training in the South and will be administered by an interdisciplinary committee composed of qualified graduate faculty members in the fields of agricultural engineering and supporting departments.

In addition to the research facilities available at API, the National Tillage Machinery Laboratory is located at Auburn, offering opportunity for graduate research in fields in which the need for advanced training of technical personnel is considered by some to be critical at present.

Major results to be accomplished by the new program, according to the Council of Deans, are: (1) The undergraduate teaching program will be strengthened by the research findings and the supply of qualified teaching personnel with advanced graduate training will be increased; (2) More research of specific interest and value to the Southeastern States will be accomplished. In addition, such a program will provide well trained personnel familiar with the problems of this area for industry, agriculture and public agencies; and (3) A better correlation between the engineering and agricultural sciences will be accomplished.

Dairy Engineering Conference

The Seventh Annual National Dairy Engineering Conference will meet February 26-27 at Michigan State University. Theme of the meeting, More Profits Through Better Engineering, will cover subjects relating to overall plant applications, processing equipment, and utilities.

Thursday forenoon will be devoted to overall plant applications and the afternoon will cover processing equipment. Utilities—electricity, refrigeration, steam and cleaning — will be discussed on Friday morning. Ultra-high temperature processes; what's new in packaging cottage cheese and ice cream; and overhead conveyors in hardening rooms are the topics for Friday afternoon. Copies of the program may be obtained by writing to Carl W. Hall, Agricultural Engineering Dept., Michigan State University, East Lansing, Mich.

To Suspend Production at Springfield Plant

The Oliver Corporation announced recently that it would suspend farm machinery production at its Springfield, Ohio, plant, effective February 28, 1959. It is reported that all equipment, grain drills, corn planters, spreaders, beet tools, cotton harvesters, forage harvesters, and front-end loaders, now being manufactured at Springfield will thereafter be produced at other Oliver plants.

New Exhibition Hall

Borg-Warner Corp. announces its new Borg-Warner Exhibition Hall, located at 200 South Michigan Avenue, Chicago, Ill., directly across from the Chicago Arts Institute. Colorful exhibits have wide general interest and informational value. The Exhibition Hall also has a Little Theatre with a seating capacity of 70 persons, which the company makes available without charge to organized groups for meetings, film showings, lectures and other uses. The hall is open to the public from 11:00 a.m. to 6:00 p.m. Monday through Saturday.

Lets Contract for New Plant

The Dayton Rubber Company has awarded a $1,600,000 contract calling for the construction of a modern rubber factory in Springfield, Mo.

The new plant will be used primarily to manufacture mechanical goods. Completion of the plant will allow for further expansion of tire manufacturing facilities at the company's Dayton, Ohio, plant. The new one-story brick and steel frame plant will house approximately 200,000 sq ft in the manufacturing area and will utilize the newest concepts in engineering and production techniques. It will employ several hundred persons at the start. The main building will be 700 x 240 ft.

EVENTS CALENDAR

January 16 — Winter meeting of *Farm Equipment Institute* by FEI Production and Marketing Dept., Hershey Hotel, Hershey, Pa.

January 26-27 — *First Annual ASLE Gear Symposium,* Morrison Hotel, Chicago, Ill. For further information write to American Society of Lubrication Engineers, 84 E. Randolph St., Chicago 1, Ill.

February 2-4 — 1959 Meeting of the *Association of Southern Agricultural Workers,* Memphis, Tenn., at the Peabody Hotel. Contact C. E. Kimmerly, Jr., secretary-treasurer ASAW, Agricultural Extension Service, Louisiana State University, Baton Rouge, La., for details.

February 4-6 — *New England Rural Electrification Institute,* Durham, N. H. For additional information write John J. Kolega, Agricultural Engineering Department, University of New Hampshire, Durham, N. H.

February 4-6—*Home Improvement Products Show* at the Coliseum, New York, N. Y. For further details write Ted Black, Public Relations, Medical Art Bldg., Reading, Pa.

February 8-14 — Observance of *National Electrical Week.* For additional information write to R. J. Gingles, 290 Madison Ave., New York 17, N. Y.

February 26-27 — *7th Annual National Dairy Engineering Conference,* Kellogg Center, Michigan State University, East Lansing, Mich. For information write Carl W. Hall, Agricultural Engineering Dept., Michigan State University, East Lansing, Mich.

March 3-8 — *30th Salon International de la Machine Agricole,* Exhibition Ground of Porte de Versailles, Paris, France. For entry card and further information write Salon International de la Machine Agricole, 95, Rue Saint-Lazare, Paris-9e, France.

April 5-10—*1959 Nuclear Congress,* Public Auditorium, Cleveland, Ohio, sponsored by Engineers Joint Council, 29 West 39th St., New York, N. Y.

April 5-16 — *First International Farmers Convention in Israel.* Write to Allied Travel Inc., 103 Park Ave., New York 17, N. Y.

May 5-7 — *14th Purdue Industrial Waste Conference,* Purdue University. For details write Don E. Bloodgood, Purdue University, School of Civil Engineering, Lafayette, Ind.

May 7-9 — *First World Congress for Agronomic Research,* Headquarters of the FAO, Rome, Italy. Organized by the

(Continued on page 52)

Cornell in '59

Members of the local arrangements committee for the 52nd Annual Meeting of ASAE were on hand to see that all were informed about the coming 1959 meeting to be held at Cornell University, Ithaca, New York, June 21 to 24. C. W. Terry, chairman of the meetings committee *(left)* and L. L. Boyd, chairman of public relations *(right)* present Dr. E. G. McKibben, president of ASAE, with a carnelian and white trimmed "sailor"

FEI Award Winners

Three members of ASAE were recipients of the 1958 Farm Equipment Institute Gold Awards "for outstanding engineering contributions to the agricultural industry and the Institute." Presentations were made by C. L. Oheim, chairman of the FEI executive committee and vice-president of Deere and Co. *(second from left)* during the 13th Annual "Dinner for Professors" held in conjunction with the ASAE Winter Meeting. Left to right, are Wayne Worthington, director of engineering research, John Deere Research and Engineering Center; Mr. Oheim; Martin Ronning, chief engineer of product research, Minneapolis-Moline Co., and B. G. Van Zee, retired chief engineer of product design, Minneapolis-Moline Co.

ASAE Motion Picture Finance Committee

The ASAE Motion Picture Finance Committee during its meeting established October 1, 1959, as target date for raising necessary funds for completion of the ASAE motion picture. Standing *(left to right)* are W. J. Ridout, Jr., editorial director of *Electricity on the Farm;* Dean L. Searls, manager, Adams Electric Coop.; Dr. E. G. McKibben, ASAE president; L. E. Bradley, field manager, American Zinc Institute; P. W. Manson, professor of agricultural engineering, University of Minnesota (representing A. J. Schwantes). Seated *(left to right)* are J. W. Borden, vice-president of sales, Eversman Mfg. Co. (committee chairman); R. G. Morgan, district manager, industrial division, Timken Roller Bearing Co.; A. W. Farrall, head of agricultural engineering, Michigan State University; and F. C. Walters, project engineer, John Deere Research and Engineering Center

Winter Meeting Sets Attendance Record

An all-time high of 1310 attended the Winter Meeting of the American Society of Agricultural Engineers held December 17 to 19 at the Palmer House Hotel in Chicago. Previous high was an attendance of 1187 in 1956. General acceptance of the downtown location seemed to be in evidence and a spirit of confidence in the future prevailed.

The ASAE Council met Monday evening, all day Tuesday and at various times to dispose of a variety of administrative matters. The Cabinet meeting held Tuesday evening was well attended. Donald P. Brown, chairman of ASAE Public Relations Committee; W. J. Ridout, Jr., vice-president of ASAE, and Gerald A. Karstens, engineering director of *Feed Age,* teamed up to explain how sections can improve public relations.

Dr. Earl L. Butz, dean of agriculture, Purdue University, spoke on "Agriculture Today — A Synthesis of Techniques" during the general session on Thursday afternoon. Other noted speakers on the general session program included: Dr. L. L. Sammett, agricultural economics dept., University of California, Berkeley, who spoke on systems engineering in agriculture; and Dr. Thomas E. Caywood, director of operations research group, Caywood-Schiller Associates, who spoke on what operations research is accomplishing for industry.

A new procedure was followed in the press room this year. T. E. Clague, publicity vice-chairman of the Chicago Section, arranged for the services of a professional organization, the Julian J. Jackson Agency, to handle public relations and publicity for the Winter Meeting. A brief summary of some of the activities conducted by this group includes: preparation and distribution of news story announcing the meeting to 1,018 publications and broadcast media; arranging television shows for Tuesday, Wednesday, Thursday and Friday mornings, a radio show Wednesday evening, and a tape in French for the Voice of America Show. A total of 493 requests for taped interviews of speakers appearing on Winter Meeting programs from 71 radio stations resulted from a questionnaire asking for types of interviews preferred. The tapes were reproduced and made available to radio stations through the courtesy of Howard Nuernberger and the Aluminum Company of America. A contact with the Mayor's office resulted in a proclamation by Mayor Richard J. Daley naming Dec. 15 to 19 Agricultural Engineers Week in Chicago.

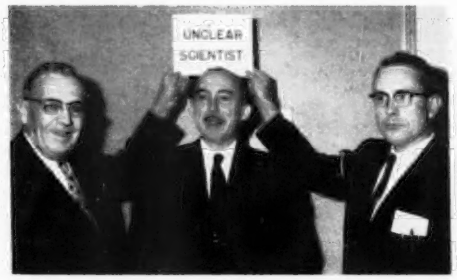
More than 100 representatives of the farm equipment industry and nearly 400 agricultural engineers and research workers from state agricultural colleges and public research agencies attended the 13th Annual "Dinner for Professors," sponsored by the Farm Equipment Institute, Thursday evening. Three ASAE members — Martin Ronning, chief research engineer, Minneapolis-Moline Co.; Ben Van Zee, retired, Minneapolis-Moline Co., and Wayne Worthington, director of research, John Deere Research and Engineering Center — were recipients of the 1958 Farm Equipment Institute Gold Awards for "outstanding engineering contributions to the agricultural industry and the Institute." The fourth recipient was Maynard Coe, director, farm division, National Safety Council, who received his award for "outstanding leadership and contribution to farm safety."

Much progress in the ASAE Motion Picture project was reported during the meeting. An account of action taken appears on page 15 of this issue.

WINTER MEETING PHOTO HIGHLIGHTS

Dr. Earl L. Butz *(left)*, Dean of Agriculture, Purdue University, and speaker during the Tuesday afternoon general session, shows interest in some of the ASAE publications displayed during the Winter Meeting. On hand to do some promoting were ASAE President E. G. McKibben and Executive Secretary J. L. Butt

An agricultural engineering family holds reunion during the Winter Meeting. Austin Skromme, 81, retired farmer of Huxley, Ia., decided that the best time to see his three sons and a son-in-law would be while they were attending a meeting of their professional society. Standing *(left to right)* are Robert Skromme, key engineer, J. I. Case Co., Bettendorf, Ia., and Harold Beaty, (son-in-law) professor of agricultural engineering, University of Illinois. Seated, *(left to right)* Lawrence H. Skromme, chief engineer of the New Holland Machine Division of Sperry Rand Corp., who will take office next June as president of ASAE; Mr. Skromme; and Arnold B. Skromme, chief product engineer, John Deere Spreader Works, East Moline, Ill. A fourth son, Austin Skromme, Jr., is assistant chief engineer of the tractor department, Caterpillar Tractor Co., Glasgow, Scotland



Having some fun, Edward A. Silver *(left)* of New Holland Machine Co. and Charles S. Morrison, *(right)* manager of product development, Deere and Co., jokingly tag Karl E. Gardner, dairy scientist, University of Illinois, as an "unclear scientist" following his presentation at the Wednesday evening Research Seminar sponsored by the ASAE Committee on Research (Moline Dispatch photo)

(Above) Robert S. Beeler, of the Eastman Kodak Co. and main speaker for the Wednesday evening Farm Structures Division Milker, was asked to lead the line for the Dairy "Smorgasbuffet" provided through the courtesy of the Pure Milk Association and the American Dairy Association of Illinois

The publications display panel attracted much attention during the entire meeting. In the foreground W. V. Hukill, head of grain harvesting and drying section, Harvesting and Farm Processing Branch, AERD, ARS, USDA, Iowa State College, examines a technical paper

(Below) Mrs. Mary Disteldorf is shown serving Illinois-made cheeses during the Milker to *(left to right)* E. L. Hansen and Ray Shawl of University of Illinois, and Don Lippke, chief engineer of the Knipco Division of the Master Vibrator Co. (Moline Dispatch photo)

E. J. Stirniman

W. R. Mogg

C. M. Shepstone

S. C. Heth

E. J. Stirniman who has been employed with the Caterpillar Tractor Co. for the past 19 years retired November 1, 1958. During the time with this company he served overseas as a district representative and most recently as an agricultural consultant in the Foreign Trade Group. He reports that he felt like a Caterpillar employee long before he joined the company, since forty years ago he worked with Holt and Best products while serving on the teaching and experiment station staff of Washington State College. Later he worked for the Soviet grain trust in Russia which set up large-scale farming. On one farm he helped assemble 300 Holt combines and 250 tractors, most of them Caterpillar Sixty models. While working with Caterpillar Tractor Co., he lived in Australia and South America. He received his agricultural engineering training with a B.S. degree from the Iowa State College. He has been a member of ASAE since 1917.

William R. Mogg has been appointed sales manager of Crucible Steel Company's spring division. He was formerly sales manager of special products at the Cleveland Graphite Bronze Co., a division of the Clevite Corp., where he had been employed since 1940 in various sales, engineering and production capacities. Prior to that he served as sales engineer for the Ohio Brass Co. He is a native of Cleveland, Ohio, and received a B.S. degree in metallurgical engineering from the Case Institute of Technology in 1936. He has been a member of ASAE since 1951.

C. M. Shepstone, formerly employed by the Mechanics Universal Joint Division of the Borg-Warner Corp. has been appointed Rockford sales representative for the Industrial Products Division of the Warner Electric Brake & Clutch Co., Beloit, Wis. He will supervise sales and service activities in northern and central Illinois, Iowa and Nebraska.

Sherman C. Heth has accepted an appointment as manager of engineering with the Jacobsen Manufacturing Co., Racine, Wis., manufacturers of lawn mowers. He was previously employed with the International Harvester Co. as chief engineer of the company's advance engineering department in Chicago.

Crawford Reid has been appointed vice-president and general manager of National Rain Bird Sales & Engineering Corp., Southwest Rain Bird Sales and Northwest Rain Bird Sales, with headquarters in Azusa, Calif. He has headed sales for these companies since 1950, and before that served as sales manager of Rain Bird Sprinkler Manufacturing Corp., Glendora, Calif., for nine years.

Robert J. Warren, who for two years held the position of field engineer with LeTourneau-Westinghouse Co., has been appointed field engineer for the construction machinery division of Clark Equipment Co., Construction Division, Benton Harbor, Mich. He will handle job estimating and secure, classify and organize technical data through field tests and regular field engineering activities. He is a graduate of Iowa State College with a B.S. degree in agricultural engineering.

C. H. Jefferson, former project director of the farm development product department, Reynolds Metals Co., has been promoted to director of the company's Farm Institute.

K. A. Harris and **A. F. Wood** have announced their newly organized agricultural engineering consulting service, Harris & Associates, Agricultural Engineers, Stuart, Florida. Both men have resigned positions as Area engineers with the Soil Conservation Service, USDA, to form the new firm.

C. Reid

R. J. Warren

Samuel F. Henry, Mercer County rural representative of Pennsylvania Power Co., has been named general supervisor of farm sales to succeed **Walter E. Gross,** deceased, and will be located in the New Castle offices. He has worked with the rural sales department in the Mercer County area since first employed by the company in 1954. Prior to joining the company he worked in the research laboratories of the Aluminum Company of America, Sealtest Co., and from 1950 to 1953 he was employed as a federal inspector by the U.S. Department of Agriculture.

Stanley E. Hill has been promoted to chief engineer of the Eversman Manufacturing Co., Denver, Colo. Prior to joining the Eversman organization, he spent several years with the Soil Conservation Service in Ohio and has worked for the John Deere Harvester Works and the David Bradley Manufacturing Co.

Max H. Ririe reports that he has received a transfer from Hill's Engineering Co., Mansfield, Ohio, to the Cobey Corporation, at Bucyrus, Ohio. This is a change from consulting work to regular employment in the organization.

Robert G. Yeck has been appointed head of the Environmental Control Section of the Agricultural Engineering Research Division, Agricultural Research Service, USDA, to succeed **Harry L. Garver** who retired June 30. This section cooperates with livestock specialists in investigations of the effect of temperature, humidity, and related factors upon animals and means of controlling the environment. He has been with the USDA since 1948 and was formerly in charge of the ARS Psychroenergetic Laboratory at the University of Missouri. His headquarters will remain at Columbia, Mo., until further notice.

Marshall B. Rainey has completed a three-month study of health problems in a number of middle east and African countries. His successful record as chief engineer for the Western region of the U.S. Public Health Service determined his selection for this honor by the World Health Organization who sponsored the project.

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NECROLOGY

Walter E. Gross, general farm sales supervisor, Pennsylvania Power Co., died suddenly October 13. He was born in Millburn, Pa., in 1903. He attended the L. L. Cooke Electrical School, taking the electrical engineering course, from 1922-1923. Mr. Gross began his career in 1923 when he became a service inspector for the Pennsylvania Power Co., known as the New Castle Electrical Street Railway Company at that time. He became lighting salesman in 1925, and from 1928 to 1937 was a line extension clerk. In 1937 he was promoted to rural representative and in May of 1949 he assumed the post of general farm sales supervisor which he held at the time of his death.

Walter E. Gross

For his continued efforts with the farm youth of his local area he was given an Honorary Keystone Farmer Degree in 1950 by the Pennsylvania Future Farmers of America. He was a past Exalted Ruler of the B.P.O.E., he held membership in Westminster Lodge 727, F. & A.M. and A.A.S.R., the Eintracht Singing Society and the Penn Power Men's Club. He was also a member of the First United Protestant Church, and has been an ASAE member since 1943. He is survived by his wife, Catherine, and two daughters.

Members of the executive and program committees of the North Atlantic Section met recently at the Harvard Club in New York. Standing are members of the program committee *(left to right)* L. H. Hammond, Electric Power and Processing; W. B. Schumacher, Power and Machinery; Joseph Bornstein, Soil and Water; and F. H. Theakston, Farm Structures. Seated *(left to right)* are R. W. Kleis, secretary-treasurer; F. W. Peikert, past-chairman; F. L. Rimback, chairman; R. L. Green, local arrangements chairman for 1959; and C. N. Turner, vice-chairman. The University of Maryland has been selected for the 1959 meeting, September 1 to 3

Pacific Northwest Section

The Pacific Northwest Section Meeting was held October 22-25 in the Memorial Union Building, Oregon State College, Corvallis. Activities began on Wednesday, October 22, at 6:00 p.m., with registration and a social hour.

Dr. E. G. McKibben, ASAE president, discussed agricultural engineering research during the general meeting Thursday, October 23, and was also invited to be the speaker for the luncheon meeting at which he presented some ASAE problems to the group. The Student Banquet, held Thursday evening through the courtesy of R. M. Wade and Co. of Portland, was held at the Benton Hotel.

During the Friday, October 24, business meeting Alaska, the newest state, was included in the Pacific Northwest Section. Also Ephrata, Washington, was selected for the 1959 meeting site. Attention was called to a student trophy award initiated during the year and the beautiful trophy donated by C. J. Hurd, Farm Electric Supply, Spokane, Wash.

Saturday morning, October 25, the group enjoyed a tour of the campus and a number attended the Oregon State College — University of Washington football game in the afternoon.

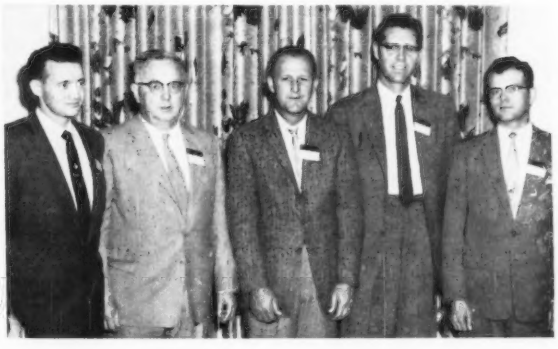
New officers include: chairman, S. J. Mech; secretary-treasurer, V. T. Townsend; first vice-chairman, G. L. Calver; second vice-chairman, J. E. Dixon; third vice-chairman, A. A. Zander, and fourth vice-chairman, T. L. Tye.

New officers for the various divisions of the section are: Power and Machinery, J. E. George, chairman, and W. L. Moden, vice-chairman; Soil and Water, M. A. Hagood, chairman, and R. A. Cochran, vice-chairman; Rural Electrification, G. W. Challenger, chairman, and J. L. Pearson, vice-chairman; Structures, Bill Griebeler, chairman, and J. E. Dixon, vice-chairman.

T. L. Tye was named chairman of the student group of the section. Dale Schulke is the new secretary and vice-chairman, and Bob Pearce was elected the second vice-chairman.

(Above left) J. B. Rodgers, left, outgoing chairman presents gavel to Stephen J. Mech, new chairman of Pacific Northwest Section

(Above right) Dierk Lange, right, University of British Columbia, accepts the Pacific Northwest Section student trophy award for the University of British Columbia Student Branch of ASAE from Dean E. Booster, section student affairs and awards committee chairman. The annual award is made on the basis of student branch activities



(Right) Newly-elected officers of the Pacific Northwest Section are, left to right: G. L. Calver, 1st vice-chairman; Stephen J. Mech, chairman; V. T. Townsend, secretary-treasurer; Albert Zander, 3rd vice-chairman; and John Dixon, 2nd vice-chairman. Thomas L. Tye, 4th vice-chairman is not shown

Southeast Section

The 1959 meeting of the Southeast Section will be held in conjunction with the Association of Southern Agricultural Workers, in Memphis, Tenn., February 2 to 4.

D. T. Kinard will be in charge of the general sessions. The Power and Machinery session will have J. H. Anderson as

(Continued on page 42)

ASAE MEETINGS CALENDAR

January 15 — MINNESOTA SECTION, Lilac Lanes Cafe, intersection of Excelsior Blvd. and Highway 100, Minneapolis, Minn.

February 2-4 — SOUTHEAST SECTION, King Cotton Hotel, Memphis, Tenn.

February 4-5 — PACIFIC COAST SECTION, Asilomar Pacific Grove, Calif.

March 12-13 — SOUTHWEST SECTION, Dallas, Texas.

February 13 — MICHIGAN SECTION, Massey-Ferguson, Inc., 12601 Southfield Rd., Detroit, Mich.

April 3-4 — MID-CENTRAL SECTION, Hotel Robidoux, St. Joseph, Mo.

April 16-18 — FLORIDA SECTION, George Washington Hotel, West Palm Beach, Fla.

April 23-24 — ALABAMA SECTION, Anniston, Ala.

JUNE 21-24 — 52ND ANNUAL MEETING, Cornell University, Ithaca, N. Y.

September 1-3 — NORTH ATLANTIC SECTION, University of Maryland, College Park, Md.

December 16-18 — WINTER MEETING, Palmer House, Chicago, Ill.

NOTE: Information on the above meetings, including copies of programs, etc., will be sent on request to ASAE, St. Joseph, Mich.

. . . With ASAE Sections

(Continued from page 41)

chairman; chairman of the Electric Power and Processing session will be E. B. Hale; E. A. Kimbrough will be in charge of the Soil and Water Session, and Walter Grub will be chairman of the Farm Structures group.

Plans for a banquet and a social hour preceding the banquet are being worked out by the Local Arrangements Committee under the direction of J. K. Jones, National Cotton Council, Memphis, Tenn. Dr. Eugene G. McKibben, director, Agricultural Engineering Research Division, ARS, USDA, and National ASAE president, will be the guest speaker.

Pacific Coast Section

The 37th annual business and technical meeting of the Pacific Coast Section will be held at Asilomar, Monterey County, California, February 4 and 5. Papers to be presented on Wednesday morning include discussions on weeds — a problem for agricultural engineers; Saline Coachella Valley land, cost of reclamation and development; and soil subsidence.

Wednesday afternoon papers will be on electronic quality grading of food products; fruit and nut harvesting, new developments for mechanization; pelleted hay feed tests; hay pelleter from a manufacturer's point of view, and aircraft for agriculture — past, present and future. A guided tour scheduled for Wednesday afternoon has been arranged for the ladies attending the meeting. J. E. Arnold, mechanical engineer of Stanford University, will discuss imagination in engineering and research in his address to be given at the Wednesday evening banquet.

Thursday morning presentations will cover subjects on lighting for dairies, automatic sprinkler irrigation with the sequamatic valve, a new approach for describing soil moisture for irrigation, gibberellins — a new tool for agriculture, applying statistics to engineering research and experimentation, and Rolligon possibilities for agriculture.

Southwest Section

The Southwest Section will hold its Annual Meeting March 12-13, 1959, at the Adolphus Hotel, Dallas, Texas. Registration will begin at 6:00 p.m., March 11.

The Soil and Water section of the program will be presented Thursday morning, March 12, with the theme "Irrigation Water Management." C. H. Hohn will discuss fertilization through irrigation water; W. F. Lytle will give a paper on irrigation of sugar cane; R. B. Duffin will consider irrigation well management; W. L. Broadhurst's discussion will be on ground water recharge, and R. V. Thurmond will analyze the importance of irrigation in humid areas.

The Electric Power and Machinery session will be held Thursday afternoon. The theme, Materials Handling, will include talks on, where materials handling fits into today's agriculture, by R. I. Paine; performance of automatic feeding systems for dairy cattle, by Glenn Nelson; pneumatic handling of grain, by N. K. Person, and power requirements of augers and conveyors, by W. S. Allen. The Student Program will follow Mr. Allen's presentation.

Eugene G. McKibben, ASAE president, has been selected as the Thursday evening banquet speaker.

The Friday morning Structures and Electric Power program will feature addresses on evaporative cooling for agricultural purposes, by Robert Ash; controlling the environment of laying hens, by L. E. Deacon; basic performance requirements for egg coolers, by G. L. Nelson, and environmental control of swine, by Philip Wemple.

The general session and business session will be held Friday afternoon. Otto Kunze will discuss scrubability tests on home surfacing materials and M. C. Tedder will give a talk on aerial application of materials to agricultural products. ASAE Executive Secretary, J. L. Butt, will conclude the session with a presentation entitled, "What I Get for My ASAE Dollar."

Alabama Section

The spring meeting of the Alabama Section will be held in Anniston, Ala., April 23 to 24. Meeting headquarters will be in the Alabama Power Company Building. The fall meeting, scheduled for October 21 to 22 is to be at Enterprise, Ala.

West Virginia Section

The West Virginia Section met November 12-13, 1958, in Keyser, for their annual fall meeting which was sponsored by the section's Soil and Water group. Fifteen students from West Virginia University agricultural engineering department also attended the meeting.

The opening session was held in the woodyard of the West Virginia Pulp and Paper Co., Wednesday afternoon, Bloomington, Md., with Berma Yerkey and Jack Vorbach leading a tour of the mill.

Following the banquet Wednesday evening, an address was given by Boyd Patton on hydrologic studies of shale watersheds. R. E. Fleek followed with a discussion of flood prevention of the New Creek Watershed and Herbert Ridder explained how flood retarding type structures are being constructed in the local area.

The group made a tour on Thursday morning observing sites recently completed at the New Creek Watershed. High point of the afternoon session was a trip to inspect the work being done near Moorefield on runoff on shaly parent material soil, as described previously by Boyd Patton. Roy Hamilton and W. H. Dickerson explained how the measuring and recording devices obtained the information for this research project.

Oklahoma Section

The annual meeting of the Oklahoma Stction was held at the Student Union Building in Stillwater, Friday, November 14. The morning program consisted of a joint meeting with the Oklahoma Farm Electric Council and was devoted to discussion of farmstead wiring and materials handling on farms.

Luncheon speaker was Dr. Karl D. Butler, Farm Counselor, Avco Mfg. Co., who presented an account of his recent trip to Russia with other ASAE members. In his address he compared Russian agriculture with our own and commented on the seven-year agricultural program the U.S.S.R. is about to launch and which they forecast will exceed the agricultural production rate of this country.

The afternoon program was devoted to water projects. Howard Matson discussed the performance of flood prevention and W. O. Ree, project supervisor, Outdoor Hydraulics Laboratory, USDA, discussed some phases of research from their laboratory and explained the use of miniature models in determining the design of structures. Bob Duffin, extension irrigation specialist, Oklahoma State University, discussed Oklahoma irrigation activities and potential.

Winners of the contest sponsored by the Portland Cement Association for the outstanding farm structures designed by students in agricultural engineering were Herb Freedman, E. G. Constene and Bill Woods, who received first, second and third prizes, respectively.

Officers elected for the coming year are: chairman, Jay Porterfield; vice-chairman, D. W. Turnbull, and secretary-treasurer, B. M. Kay.

Tribute was given Jim Matthews, outgoing chairman, for his excellent leadership during the past year.

RESEARCH NOTES

Brief news notes and reports on research activities of special agricultural-engineering interest are invited for publication under this heading. These may include announcements of new projects, concise progress reports giving new and timely data, etc. Address: Editor, AGRICULTURAL ENGINEERING, St. Joseph, Michigan.

Excessive Drying Affects Cotton Fiber Quality

Research indicates that excessive drying and other ginning practices can adversely affect cotton fiber, resulting in deficient spinning performance and yarn quality, according to Bill K. Power, research principal at the Textile Research Laboratory of Texas Technological College at Lubbock, and Walter E. Chapman, cotton technologist at the Southwestern Ginning Laboratory of USDA's Agricultural Research Service at Mesilla Park, N. M.

Studies of seed cotton and lint during cleaning and ginning show that moisture content may hold the key to good cleaning and ginning without a reduction in fiber character, the researchers note.

Mechanical Cotton Harvesters Call for Proper Weed Control

Proper weed control is mandatory if mechanical cotton harvesters are to be used successfully, according to a research report by Thomas H. Garner, Henry D. Bowen, and James A. Luscombe.

In order they are: research instructor and associate professor in the department of agricultural engineering at North Carolina State College, and senior agricultural engineer with the Harvesting and Farm Processing Branch, AERD, in USDA's Agricultural Research Service.

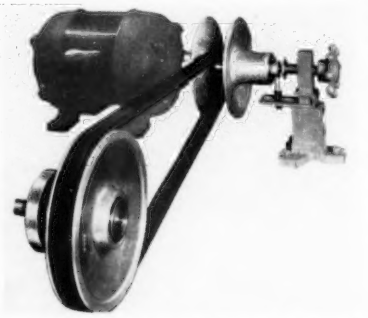
The researchers say weed control, particularly of grass, is one factor responsible for only two percent or less of Southeastern cotton being harvested mechanically.

After one year of field tests aimed at defining proper weed control, they conclude: it takes only a few grass plants that germinate early with cotton to reduce quality. Lint cotton contaminated with grass has a higher percentage of manufacturing waste, a lower yarn strength, and appearance index when given spinning performance tests.

The first year's testing indicated that grass which germinates after late June does not cause grade reductions, even in higher densities when early harvesting is practiced. (However, a survey in very wet 1957 indicated that grass emerging as late as August 1 grew large enough to seriously contaminate cotton.) Grass germinating in late June causes one grade reduction when late harvesting is done. *(Continued on page 54)*

Variable-Speed Sheaves

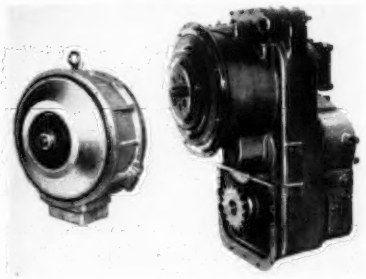
Speed Selector Inc., P.O. Box 312, Chagrin Falls, Ohio, has introduced a new line of wide-belt, smooth-faced variable-speed sheaves which operate on fixed centers employing $1\frac{3}{16}$-in. wide V-belts. The controllable sheave is mounted on the motor



and the spring-actuated sheave is mounted on the shaft of the machine to be driven. The drives are available in capacities of 1 to 3 hp with speed change ratios as high as 8 to 1. Employing a 1750-rpm motor, a range of from about 400 to 3200 rpm can be obtained at the driven shaft.

Hydraulic Drives

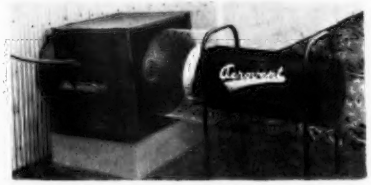
Rockwell-Standard Corp., Transmission and Axle Division, 100-400 Clark Ave., Detroit 33, Mich., has acquired from Westinghouse its line of hydraulic torque con-



verters and power shift transmissions. This new line is developed to meet special needs in earth moving, construction, and materials-handling equipment. According to reports the unit combines the advantages of a hydraulic torque converter and a fluid coupling, and provides the equivalent of a gear transmission with hundreds of ratios which automatically select the right ratio to utilize the maximum power efficiently.

Crop-Drying Equipment

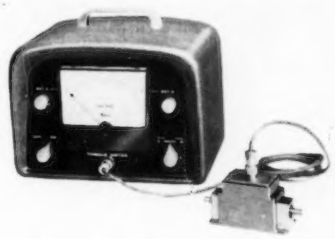
Aerovent Fan & Equipment, Inc., Lansing, Mich., has developed a lightweight, portable gas-fired supplemental heater which



has a capacity up to 250,000 Btu output per hour and is designed to supply warm air to any fan where additional heat is needed to boost natural drying. The unit is gas-fired, has its own built-in fan and automatic controls. Telescoping legs are adjustable to fit most fans. Another product of the company recently announced is a drying system employing an up-draft of hot air distributed evenly through breather holes in a wagon bottom. A three-outlet canvas duct distributes air via a built-in air chamber under three wagons, which have a capacity of 130 bu of grain or 2 tons of wet hay. The loaded wagons are dried in rotation as a crop is harvested.

Announces New Torquemeter

Metron Instrument Co., 432 Lincoln St., Denver 3, Colo., has developed a new torquemeter for measuring dynamic torques from 5 to 250 oz-in. full scale for laboratory, field or shop use. Special units for higher torques are available. These torquemeters are said to measure dynamic torques

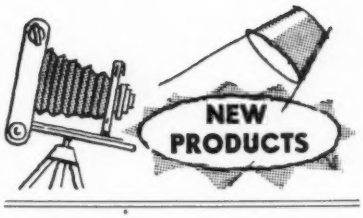


on shafts turning between 50 and 12,000 rpm with an accuracy within 2 percent of full scale. Easy-to-read linear scales and simple calibration are provided. It is reported that torque readings are independent of shaft speed and direction of rotation. For remote readings the indicator can be connected electrically to the torque pickup.

Engine with Clutch Reduction Unit

The Kohler Co., Kohler, Wis., announces that its Model K331CR air-cooled, short-stroke, 4-cycle engine is equipped with a

combination clutch reduction unit. The engine is rated at 12½ hp at 3200 rpm and is designed for applications requiring heavy starting loads and low PTO speeds. The clutch-reduction assembly combines a dry-type clutch equipped with anti-friction ball bearings and a chain-driven reduction gear with the PTO shaft mounted on rolled bearings. It is available in 2:1, 3.25:1 and 3.79:1 reduction ratios. Starting equipment consists of either conventional rope starter or 12-volt combination starter-generator.



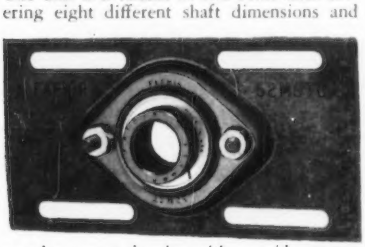
Dual-Purpose Crop-Drying Fan

Behlen Manufacturing Co., Columbus, Nebr., has introduced a dual-purpose fan capable of developing the higher pressures

needed to force-dry shelled corn and small grains. The unit is operated by ball-bearing motors at 3450 rpm, for single or three-phase operation. The fan, housed in 14-gauge steel, has a coupling ring for fast connecting to 18 or 24-in. aeration tubes. The fan end of the housing is covered with a heavy mesh guard screen to insure maximum safety. Balanced cast-aluminum fan blades, set at a quick-drying pitch are installed on the motor shaft with taper-lock bushings. The unit is adapted for use with all types of storage structures — cribs, bins, curving or conventional type buildings.

Pressed-Steel Take-Up Unit

Fafnir Bearing Co., 37 Booth St., New Britain, Conn., announces a new, ball-bearing, pressed-steel take-up unit as a new cost-cutting feature in farm implement design. The unit is available in two basic sizes covering eight different shaft dimensions and



can be mounted using either guide-type or bolt-type methods and reportedly can accommodate misalignment without adjustment. This bearing is sealed and permanently prelubricated and is equipped with self-locking collar which is said to reduce installation to a twist of the wrist. No machining of shaft shoulders is required. No mounting devices are needed. *(Continued on page 44)*

. . . New Products

(Continued from page 43)

Mulch-Hoe Lister Press Drill

John Deere, Moline, Ill., announces the new John Deere LZ-B mulch-hoe, heavy-duty press drill designed for dryland farming conditions. For spring seeding and 7-in. spacing, it can be equipped with three ranks of mulch-hoe openers; for fall seeding and 14-in. spacing, it can be equipped with two

ranks of lister openers. The dry-fertilizer attachment features a new feed that meters granular and pelleted fertilizer with accuracy. The drill is also equipped with a large liquid fertilizer attachment. A large capacity grain box holds 1½ bu per linear foot. Other features are heavy-duty caster-wheel assemblies, roller bearings in the caster wheels, larger and stronger pressure rods and pressure arms, and high-clearance equalizer bars.

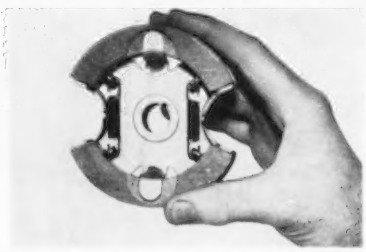
Tube Bunk Feeder

Badger Northland, Inc., Kaukauna, Wis., announces a new tube bunk feeder, designed to provide fast, even distribution of all types of feed to livestock feed bunks. It reportedly will mix any ration or rations thoroughly and distribute them evenly the

entire length of the bunk. Flow of feed is controlled with a single lever by rotating the tube. The tube rests on special ball bearing rollers and is constructed of 14-gauge galvanized steel with holes every 2 ft. The feeder operates with a 1½-hp electric motor.

Multipurpose Centrifugal Clutch

Fairbanks, Morse & Co., Magneto Div., Beloit, Wis., announces development of a new straight centrifugal clutch with only four moving parts. Two springs and two shoes are the only moving parts required



to make this simple design suitable for application on electric motors and small gasoline engines. It can be used to accelerate high inertia loads when smooth starting is essential, gives overload protection in situations where damaging overloads may occur, and it is especially suitable for pulsating loads. It will also provide free wheeling when the prime mover is stopped, and can be used to furnish dual drive from the motor or engine. It is available in capacities from 1 to 15 lb-ft at from 1400 to 3600 rpm.

Contour Cushion Seat

Milsco Mfg. Co., 2758 N. 33rd St., Milwaukee, Wis., announces a contour cushion seat designed especially for heavy-duty mo-

bile equipment. The seat is built up on a sturdy steel base for extra strength and durability. Called the "Road King," this seat is heavily padded with four inches of foam rubber in the seat and two inches of foam rubber at the back. There is a choice of covering materials. Four air holes located at the back of the unit provide adequate ventilation and insure maximum driver comfort. The seat is available with a special Milsco riser or the torsilastic suspension.

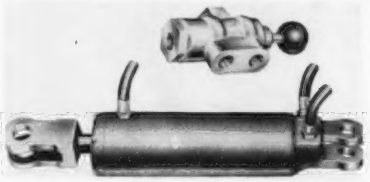
LP-Gas Vaporizer-Regulator

Beam Products Mfg. Co., Los Angeles 65, Calif., announce a new LP-gas vaporizer-regulator for use on internal-combustion engines up to 60 hp. It includes a patented built-in vacuum lockoff device and freeze-plug protection. Both primary and secondary regulators are readily accessible

and parts can be quickly replaced in the field without the use of special tools. It is being furnished with special water-runner-type castings which permit its installation between the thermostat housing and engine head, which eliminates the need of mounting brackets and also requires only one water line.

Hydro-Stop Cylinder and Valve

Densmore Eng. Co., Inc., P.O. Box 1557, Oakland 4, Calif., announces a heavy-duty, double-acting hydraulic cylinder which allows the operator to change and maintain the desired stroke hydraulically from a remote station or location. It features a floating piston within the cylinder which is controlled by a special valve. The valve can



be used with any existing 4-way hydraulic system, it is said. The floating piston is hydraulically positioned and set at any desired stroke length. It will continue to repeat this stroke until the position of the floating piston is changed by the operator. Rod and base clevises of the cylinder are cast steel; the rod is chrome plated, and the pistons are of aluminum alloy.

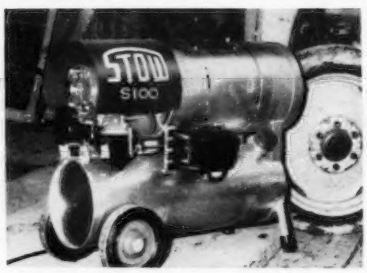
PTO Manure Spreaders

The J. I. Case Co. announces two new PTO manure spreader models of 115 and 135-bu capacity, respectively. A feature of both models is an exclusive V-belt drive teamed with an exclusive conveyor drive

which reportedly gives uniform spreading and smooth, quiet operation. In addition, both models have a treated marine plywood box, all-steel beaters, and an adjustable, slanting arch.

Portable Heater with Built-in Thermostat

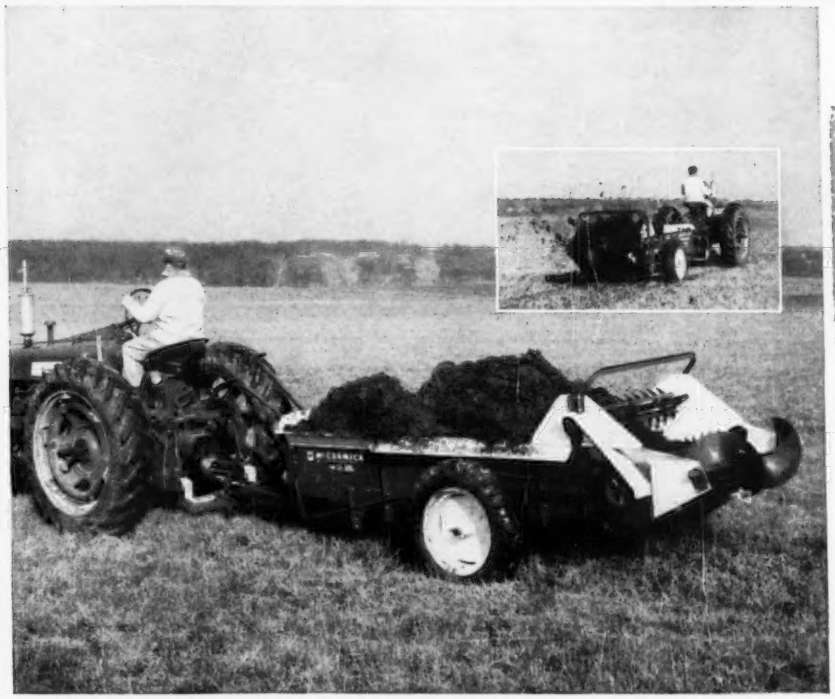
Stow Manufacturing Co., 39 Shear St., Binghamton, N. Y., has announced a new recirculating oil-fired portable heater suitable for a wide variety of uses. It is available in six different sizes with output ranging from 100,000 to 1 million Btu per hour. It is actually a furnace on wheels, complete



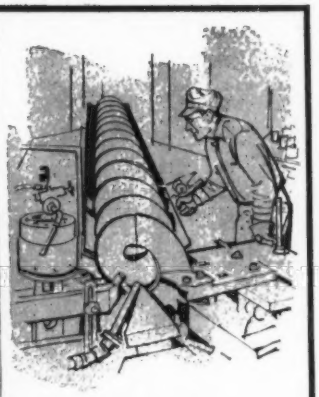
with automatic ignition. It is driven by an enclosed combustion chamber that reportedly provides complete fuel combustion without odor or fumes. The heater also features a twin-disk air control designed to compensate for variations in fuel, temperature, or altitude. It is also provided with a low-fuel cut-off switch.

(Continued on page 46)

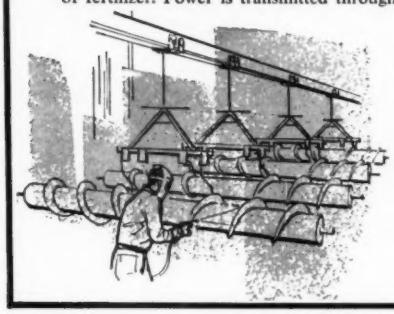
What LINK-BELT augers contribute to the design of your machines



INTERNATIONAL HARVESTER COMPANY MANURE SPREADERS use Link-Belt right and left hand sections of flighting, mounted on a common shaft, to provide widespread distribution of fertilizer. Power is transmitted through Link-Belt chains and sprockets.

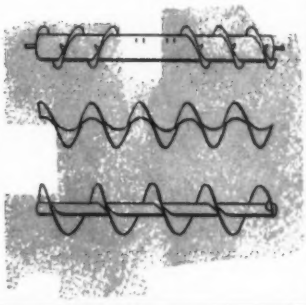


LATEST MACHINES AND METHODS assure auger uniformity, accuracy. Sheets for tubing are jig punched, then rolled to be true round. Flighting is cold rolled for slip fit on tubing and welded for permanent alignment.



QUALITY "SAFEGUARDS" make sure all Link-Belt augers are delivered in perfect operating condition. Straightness is carefully checked before shipping . . . painting prevents rusting . . . extra care is taken in handling, loading.

SELECTED FLIGHTING is available from Link-Belt to meet any auger application — helicoid, cut flight, short pitch, ribbon flight, double flight and many other designs — in the metal and finish best suited for your requirements.



. . . and why they're the consistent choice of leading farm machine manufacturers

Simplicity, strength, exactness of construction—all are combined in Link-Belt augers to assure long-lived, dependable performance on your machine.

Every Link-Belt auger is a uniform, smooth, accurately rolled product . . . one sturdy, compact basic assembly with no other moving parts to cause excessive maintenance. Only selected steels are used, and Link-Belt's modern, specialized machinery achieves consistent flighting uniformity.

Link-Belt offers augers in a full range of diameters, gauges and pitches. For details, call or write your nearest Link-Belt office. Ask for Book 2289.

LINK-BELT

FARM MACHINE AUGERS

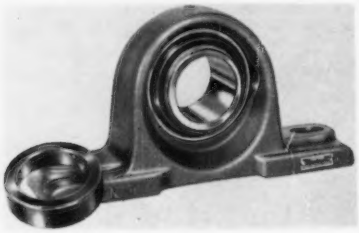
LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 14,929

. . . New Products

(Continued from page 44)

Relubricatable Pillow Blocks

The Fafnir Bearing Co., 37 Booth St., New Britain, Conn., announces two new series of relubricatable ball bearing pillow blocks featuring improved seals. The new units are designated as the LSA or stand-



ard series, and the LSAO or heavy-duty series. Both lines incorporate integral seal bearings. The newly designed housing is said to provide greater strength combined with an overall streamlined appearance. Descriptive folders on the two series are available from the manufacturer.

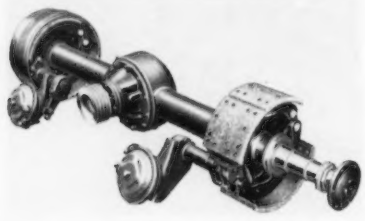
Ball-Bearing Cam Follower

McGill Mfg. Co. Inc., Bearing Division, Valparaiso, Ind., announces a new cam-follower-type roller bearing which embodies a new-type construction intended specifically for large-quantity use in farm machinery and similar equipment where the precision obtainable with the company's regular cam follower line is not required for dependable

operation. The manufacturer reports that basic in the design is the ability to incorporate double labyrinth seals which retain the lubricant and provide protection against dirt and other foreign material. The construction features accurately turned surfaces with carburized races and hardened and ground rollers.

Live Trailer Axle

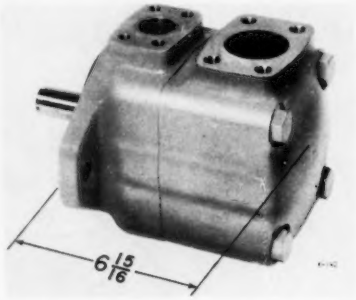
Transmission and Axle Division of Rockwell-Standard Corp., 100-400 Clark Ave., Detroit 32, Mich., has announced a new power-take-off trailer axle to provide power



to operate mobile refrigeration units intended to eliminate the need for an auxiliary gasoline engine and to provide savings both in lower initial costs and also low operating costs and less maintenance. Gears in the differential-type gearbox are actuated by movement of the rear wheels to provide power for refrigeration and other mechanical devices.

Hydraulic Pump Features Light Weight, High Speed

Vickers, Inc., Division of Sperry Rand Corp., Detroit 32, Mich., announces its new Series 35 hydraulic pump for construction and materials-handling equipment. The three pumps in this series have a common housing. Three different capacities are available through a choice of pumping cartridges. New design and engineering concepts permit increased speeds (up to 2000

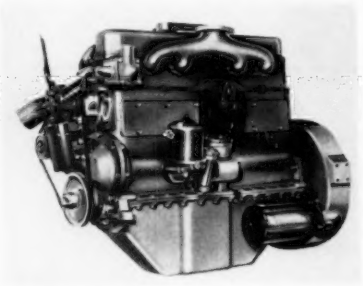


rpm) and operating pressures (up to 2000 psi) for pumps of this range of capacities (31.5 through 45.5 gpm at these speeds and pressures). The higher pressures and speeds are said to permit size reduction of all hydraulic components — smaller lines, smaller valves, smaller actuating cylinders and motors. In addititon to reduction in system weight and required space the company reports that the unit offers a saving in system cost per horsepower.

New High-Speed Diesels

Hercules Motors Corp., 101 11th St., Canton 2, Ohio, has introduced two high-speed 6-cylinder diesel engines designed for applications in which speeds of 1800 to 3000 rpm are desired.

The new DDH engines are offered in two sizes with 298 and 339-cu in. displace-

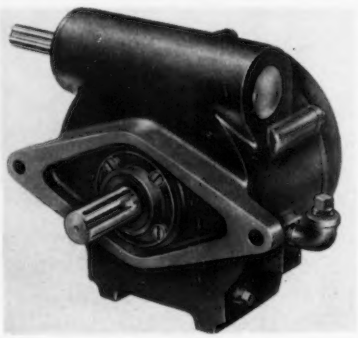


ment with ratings up to 112 hp at 3000 rpm, and 122 hp at 3000 rpm, respectively.

These engines were said to be developed primarily for marine use and for use in road and highway service equipment, particularly equipment using hydraulic torque converters.

Worm and Planetary Gear Transmission

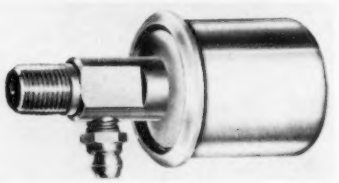
Merkle-Korff Gear Co., 213 N. Morgan St., Chicago, Ill., announces a new combination worm and planetary gear transmission suitable for poultry feeders, egg graders, fruit sorters and other agricultural equipment. This transmission is said to deliver



225 ft-lb of torque at 8 rpm with ¾-hp input. The initial stage of reduction is a high-carbon alloy steel, heat-treated, ground and polished worm which mates with a specially developed long-wearing aluminum-bronze worm gear. Net weight of the unit is 52½ lb.

Bearing Lubricator

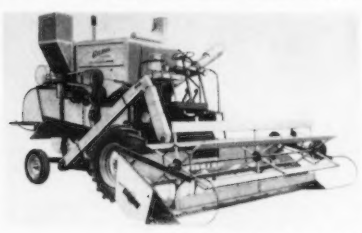
Anchor Chemical Co., 10723 Briggs Road, Cleveland 11, Ohio, announces a new automatic bearing lubricator that holds a reservoir of lubricant and automatically injects grease only as needed. The position of the pressure cup on the unit signals at a glance the amount of grease remaining in the reservoir. This lubricator 2¼ in. long



and 1⅛ in. in diameter is said to operate in any position and can be mounted in cramped positions with standard adapter fittings. It can be filled by any standard grease gun. The combination of bearing vacuum and spring pressure in the lubricator is said to discharge only enough grease to replace the amount used in the bearing.

Self-Propelled Combine

Allis-Chalmers Mfg. Co., Milwaukee, Wis., announces two new models of the Gleaner-Baldwin self-propelled combine for 1959, a



(Continued on page 48)

POWER STEERED TRACTORS MAKE FARMING MORE EFFICIENT . . . EASIER . . . SAFER

By simply "pointing" his power-steered tractor, your customer goes exactly where he wants—with no wheel fight, no strain, even on rough terrain. This means straight furrows which mean good farming! What's more, he always has one hand free to make adjustments on implements without stopping or wavering.

It is no wonder that at the end of the day on a power-steered tractor, a man is still fresh—ready for the chores and a pleasant evening. And it is important to remember this: With better control of steering, the danger of accidents is reduced.

As a pioneer of power steering—for trucks, autos, buses and off-the-road equipment as well as for tractors—Bendix provides the proven design and workmanship that assure trouble-free performance.

P.S. *Because Bendix* Power Steering can be adapted to existing steering linkage, tractor manufacturers can install power steering without costly changes on production lines.*

*REG. U.S. PAT. OFF.

Bendix PRODUCTS DIVISION South Bend, IND.

Bendix AVIATION CORPORATION

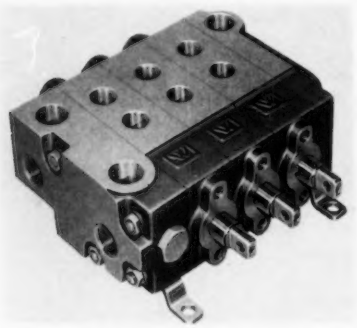
. . . New Products

(Continued from page 46)

new feature of which includes a new quick-detachable header designed to save time and labor in attaching and detaching. With the combine in position for attaching the header, the hydraulic control raises or lowers the cylinder housing for proper alignment of hook-type latches with mating slots. When hooks are in place, the operator taps spring-loaded wedge pins into locking position, forming a rigid self-tightening latch. The seat on the new models has been redesigned for added operator comfort, including foam rubber padding for both back rest and seat. The header auger is adjustable for height, for use in long, tangled grain or in extremely heavy yields. A guard rail on top of the separator deck to the rear of the engine provides additional safety for service work.

Directional Control Valves

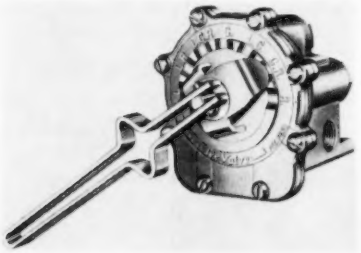
Webster Electric Co., Racine, Wis., announces a new directional-control valve of sectional construction. These valves are suitable for arrangement in stacks of 1 to 6 working sections and provide a large variety of uses in industrial and agricultural



fields. Designed especially for multiple-function installation, the company states that these valves are appropriate for operating pressures up to 2000 psi and are rugged enough to take shock pressures of 2½ tons per square inch. They are available in full capacities of 20 and 40 gpm, and are provided with flat characteristic relief valves (differential of area type on the 20-gpm size and pilot type on the 40-gpm size).

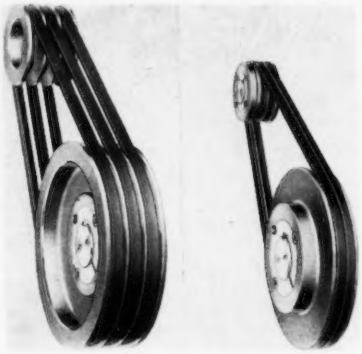
Improves Sprayer Valves

Spraying Systems Co., 3226 Randolph St., Bellwood, Ill., announces a change in its overall line of T-valves for selective spray control in boom spraying. This design change was made to provide a hand grip "stop" so that position of the operator's hand will remain clear of the valve, preventing accidental chafing of fingers. Selection of valve setting is made by rotating the control handle to any desired indexed position. There is a choice of seven valve positions and selection is made with the valve in the off position. The spray is turned on by raising the handle to a horizontal position and thus on-and-off control is obtained without disturbing the setting.



V-Belt Drives

Dodge Mfg. Corp., Mishawaka, Ind., announces a new line of V-belt drives, featuring smaller and lighter sheaves and V-belts said to provide higher capacity at lower cost. The new line, which carries the trade name Dyna-V, reportedly covers the complete range of horsepower capacities available in conventional drives. With this



new line the company reports that the majority of industrial drives can be handled with belts only ⅜-in. wide, and sheaves that are greatly reduced in both width and outside diameter. The new drives, it is said, make it possible for the design engineer to save space and cut costs in power transmission.

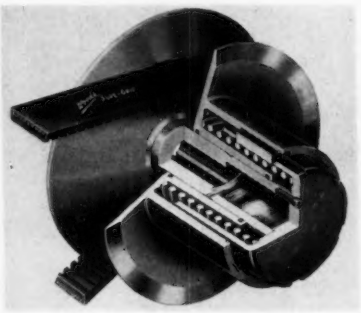
Ball-Bearing Pillow Block Unit

Stephens-Adamson Mfg. Co., Sealmaster Bearing Div., Ridgeway Ave., Aurora, Ill., announces a new high-strength, low-cost line of ball-bearing pillow blocks to be known as the "LP" Series. This line consists of a precision, one-piece malleable unit ready for assembly on the shaft. The malleable one-piece housing is said to pro-

vide greater strength and lighter weight. Each unit is permanently sealed and prelubricated with a high-grade lubricant for long life. Units are available in ¾, ⅞, 15/16, 1, 1 3/16, 1¼, 1⅜, and 1 7/16 inch shaft sizes. For additional information write to the company for Bulletin 1058.

Variable-Speed Sheave

T. B. Wood's Sons Co., Chambersburg, Pa., announces a series of variable-speed pulleys incorporating a new design said to eliminate fretting corrosion as well as freezing and sticking. Bearing surfaces are re-oiled from an oil reservoir with each rotation of the pulley. The continuous rotational pumping action of the flange hub on the sleeve constantly renews and dis-



tributes the oil film on the bearing surface. There are no keys to obstruct the flow of oil around the surfaces between the flange hub and sleeve. A series of nylon-faced rubber keys, located outside the bearing surfaces, is used to transmit power from the stationary to the moving flange through a removable sleeve cap. The torsionally resilient keys not only carry the belt torque but are said to provide even distribution of the load and equal transmission of power by both flanges. The series consists of five pulleys rated respectively, 2, 3, 5, 10, and 15 hp.

Pressurized Gasoline Vent Cap

Central Illinois Mfg. Co., P.O. Box 157, Bement, Ill., has introduced a new, low-cost, vacuum-pressure vent cap for above-ground gasoline storage tanks. The new vented cap works like a pressure radiator cap, having a spring-loaded valve which

seals in the pressure up to 3 psi. As the temperature inside the tank rises and the gasoline begins to evaporate more rapidly, it builds up its own pressure, which slows down the evaporation rate. In addition to the spring-loaded valve to create the build-up of pressure, it also has a vacuum relief valve to allow air to flow in when the temperature falls.

The manufacturer reports that in addition to the reduction in evaporation the new vent cap stops or reduces gasoline weathering, loss of starting quality, loss of warm-up quality, loss of delivered octane rating, gum formation, crankcase oil dilution, and water condensation.

Bushing with a Bearing alloy lining

Now you can specify economical rolled, split steel bushings lined with bronze, babbitt, copper or aluminum alloy to provide bearing load-carrying qualities *with the advantages of low cost*. They are available in many lengths and diameters, with straight, clinch, butt or special seams. They can be ball indented and have oil holes, grooves, notches, slots, as required. Quality controlled manufacturing to meet your specifications. We provide complete engineering service. A copy of the "Formed Bushing Design Guide" will be sent on request.

FEDERAL-MOGUL DIVISION

FEDERAL-MOGUL-BOWER BEARINGS, INC., 11081 SHOEMAKER, DETROIT 13, MICHIGAN

The following is a list of recent applicants for membership in the American Society of Agricultural Engineers. Members of the Society are urged to send information relative to applicants for consideration of the Council prior to election.

Baumeister, Alois B.—Design engr., Massey-Ferguson Ltd. (Mail) Buchenweg 7, Eschwege/Werra, Germany

Boersma, Lyckle — Asst., dept. of agronomy, Cornell University, Ithaca, N. Y.

Bogdan, Alexander — Engr., product dev. dept., Deere and Co., 301 3rd Ave., Moline, Ill.

Bridge, Galen S.—Agr. engr., (SCS) USDA, Northern Maine. (Mail) Box 910, Presque Isle, Maine

Charnetski, John — Product education mgr., Massey-Ferguson Ltd. (Mail) 1 Hemford Cresent, Don Mills, Ont., Canada

Christie, Craig E. — Des. engr., John Deere Research and Engineering Center. (Mail) 3406 Dallas Dr., Cedar Falls, Iowa

Clark, Mayhew M. — Agr. specialist, Visking Co. (Mail) 503 E. 5th St., Sheridan, Ind.

Clay, Charles H. — Vice pres. and mgr., crop drying div., Clay Equipment Corp. (Mail) 1500 Belle Ave., Cedar Falls, Ia.

Daskal, George H. Jr. — Works mgr., Perfection Gear Co., Harvey, Ill.

Dickerson, Charles L. — Area engr., (SCS) USDA, Cameron, Mo.

Doering, Charles W. — Project engr., Minneapolis-Moline Co. (Mail) 8243 Upton Ave., S. Minneapolis 20, Minn.

Doran, Curtis W. — Gen. mgr., Kengas, Inc., Box 526, Owensboro, Ky.

Filmer, Robert W. — Dev. engr., Procter and Gamble Co. (Mail) 4233 Oriole St., Hamilton, Ohio

Fonken, David W. — Asst. prof. and asst. agr. engr., dept. of agr. eng., University of Arizona. (Mail) 5314 E. Lee, Tucson, Ariz.

Foster, Jack F. — Product engr., John Deere Spreader Works. (Mail) 2405 5th St., Moline, Ill.

Gustafson, Lloyd E. — Des. engr., Superior Separator Co. (Mail) Box 71, Maple Plain, Minn.

Hewitt, Douglas — Exec. secretary, Farm Equipment Institute, 608 S. Dearborn St., Chicago 5, Ill.

Heyvaert, John C. — District engr., Torrington Co. (Mail) 1526 Monterey Court, Bettendorf, Iowa

Hobolth, Hayes M. — Eng. trainee, John Deere Waterloo Tractor Works. (Mail) 1600 E. Ridgeway Ave., Waterloo, Iowa

Jones, Ralph L. — Sales engr., Farm Pipe Lines, Inc. (Mail) Box 756 Ft. Morgan, Colo.

Kraeft, Norman J.—Farm service dir., WGN, Inc., 441 N. Michigan Ave., Chicago 11, Illinois

Looker, Olin L. — Sr. des. engr., J. I. Case Co. (Mail) 1610 N. Shore Dr., Moline, Illinois

MacDonald, Fred D. — Chairman, manpower committee, International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

McDonough, E. R. — Product engr., Allis-Chalmers Mfg. Co. (Mail) 314 Talley, LaPorte, Ind.

Matthews, Robert C. — Marketing res. consultant, Doane Agricultural Service, Inc. (Mail) 5144 Delmar Blvd., St. Louis 8, Missouri

Monson, Aubrey E. — Engr., John Deere Spreader Works. (Mail) 1318½ 14th St., Moline, Ill.

Parks, Richard D. — Trainee, service dept., Caterpillar Tractor Co. (Mail) 117 A Vandenberg, Sherman, Tex.

Oehler, A. W. — Chief product engr., John Deere Harvester Works. (Mail) 2414 23rd Ave. B, Moline, Ill.

Persson, Sverker — Assoc. prof., Farm Machinery Institute, Royal Agricultural College, Ultuna, Uppsala, Sweden. (Mail) Dept. of agr. eng., Michigan State University, East Lansing, Mich.

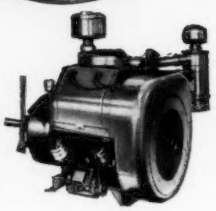
Peterson, Hugh S. — Partner and business mgr., H. L. Peterson Co., 234 W. Commerce, Dallas 8, Tex.

Powell, Frank H. — Sales rep., Taylor-Colquitt Co., Box 1491, Spartanburg, S. C.

(Continued on page 52)

How YOU can benefit from—

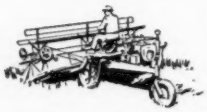
This year of 1959 is the Golden Anniversary of Wisconsin Engines. It heralds 50 years of continuous engine progress. Fifty years of engineering development and exclusive specialization in the design and manufacture of engines.



• Originally manufactured in a power range up to 200 hp., Wisconsin Engines helped to make automotive history as well as supplying dependable power for many industrial applications—service that called for the most advanced engineering.

• Heavy-duty design and construction and High Torque performance have been traditional features of *all* Wisconsin Engines. You get longer life from Wisconsin Engines and lowest cost maintenance.

• Today the Wisconsin line comprises the most complete line of Heavy-Duty Air-Cooled Engines in the industry. They are supplied in 4-cycle single cylinder, 2-cylinder and V-type 4-cylinder models in a complete power range from 3 to 56 hp. There is a Wisconsin Engine of the right size and type to fit the job and the machine.



AGRICULTURE

• Every Wisconsin Air-Cooled Engine is designed for heavy-duty service under all climatic conditions from low sub-zero to 140° F. You get the *Most Engine* for your money for MOST HP. HOURS of service.

CONSTRUCTION

• For 1959 Wisconsin has available a complete line of factory-built LPG Engines (including conversion kits for field installation on Wisconsin gasoline engines). In addition, we offer a new line of heavy-duty, quality-built Vertical Shaft Engines, from 3 to 7 hp.

RAILWAY

• More than 2000 convenient Wisconsin Authorized Service Stations stand ready to provide expert servicing and factory-built parts for all Wisconsin Engines.

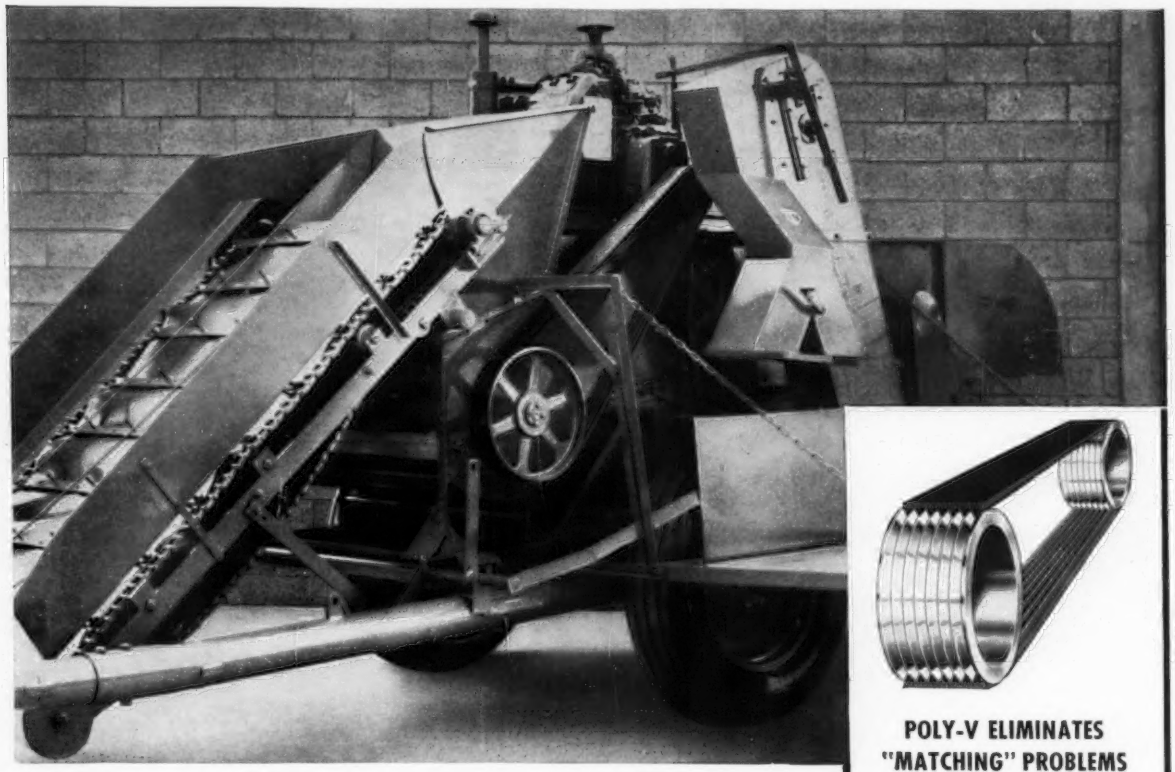
Constructive experience is a priceless asset. The benefits to the manufacturer, distributor and user of power equipment are many. You are best served in all respects when you specify "WISCONSIN ENGINES"... *for better service, low-cost maintenance, trouble-free operation and long engine life.* Write for engine bulletin S-237.

INDUSTRIAL

WISCONSIN MOTOR CORPORATION

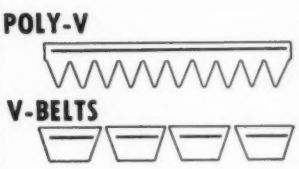
World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 46, WISCONSIN



POLY-V ELIMINATES "MATCHING" PROBLEMS IN THE FIELD

The Poly-V Belt is a SINGLE UNIT across full width of sheave—NOT an assembly of SEVERAL V-BELTS.



POLY-V DELIVERS MORE POWER

Poly-V increases the drive capacity 30% to 50% (more in many cases) in the same space as standard V-belt drives.

NO OTHER belt drive delivers more power than Poly-V in the same space.

R/M Poly-V® Drive

Delivers *More* Power in *Less* Space

Unique features of R/M's patented Poly-V* Drive reduce width of sheaves and eliminate belt matching problems for the newly designed peanut harvester shown above. Here's why:

R/M Poly-V* Drive employs a *single*, endless, parallel V-ribbed belt running on sheaves designed to mate precisely with the belt ribs. Flat belt strength and simplicity *plus* the high V-groove grip of V-belts add up to *twice* the tractive surface of ordinary multiple V-belts. Higher horsepower capacity of the single unit belt permits narrower sheaves . . . *less* shaft overhang, *less* drive weight. R/M Poly-V* Drive runs smoother because there's no sinking of the belt in the sheave grooves. Poly-V belt speed ratio and belt position remain constant from *no* load to *full* load for uniform power delivery with less wear on belt and sheaves. Drive dependability is not limited to individual V-belt life—Poly-V practically eliminates machine downtime for belt replacement. Inventories are minimized because just *two* cross sections of Poly-V belt meet *every* heavy duty requirement.

Equipment designers and manufacturers find Poly-V the ideal belt drive for heavy duty applications. Let R/M engineers assist you in determining the best installation to meet your needs. Contact an R/M representative . . . or write for Bulletin M141.

*Poly-V is a registered Raybestos-Manhattan trademark.

RM-900

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. . . Membership Applicants

(Continued from page 50)

Rad, C. V. — Asst. agr. engr., dept. of agr., Government of Andhrapradesh State, India. (Mail) Vijayawada, Dt., Kistna, S. India

Ratajczak, Jan W. — Des. engr., Starline Inc., Harvard, Ill.

Rogers, Henry B. — Project engr., Massey-Ferguson Ltd. (Mail) 42 Strawberrybank Rd., Kilmarnock, Scotland

Sangrey, Kenneth — Draftsman, New Holland Machine Div. of Sperry Rand Corp. (Mail) 2129 Old Phila. Pike, Lancaster, Penna.

Schmoeller, Garrett M. — Sales engr., Dayton Rubber Co. (Mail) 533 Park Ave., Elmhurst, Ill.

Schoessel, C. A. — Administrative eng. asst., John Deere Spreader Works, East Moline, Ill.

Shelley, Thomas R. — Agr. engr., (SCS) USDA. (Mail) 1800 Virginia St., Silver City, N. M.

Sherfey, James D. — Elecn. adviser, Farmers Rural Electric Coop. Corp. (Mail) 300-C S. Liberty St., Glasgow, Ky.

Stenstrom, Lars A. — Agr. engr., F. A. O. Mission to Chile, Basilla 10095, Santiago, de Chile

Young, William A. — Administrative asst. engr., John Deere Harvester Works. (Mail) P.O. Box 327, Orion, Ill.

TRANSFER OF MEMBERSHIP

Beach, Robert E. — Project engr., Minneapolis-Moline Co., Hopkins, Minn. (Associate Member to Member)

Butler, Beverly J. — Asst. prof., agr. eng. dept., University of Illinois, Urbana, Ill. (Associate Member to Member)

Holt, John W. — Asst. prof., State University of New York Agricultural and Technical Institute. (Mail) 240 12th Ave., Babylon, L. I., N. Y. (Associate Member to Member)

Johnson, W. M. — Account executive, Campbell-Ewald Co., 4-217 GM Bldg., Detroit 2, Mich. (Affiliate to Member)

Knapp, Lafayette W. Jr. — Asst. prof., dept. of agr. eng., Riley-Robb Hall, Cornell University. (Mail) 904 Coddington Rd., Ithaca, N. Y. (Affiliate to Associate Member)

Loper, Willard H. — Asst. prof., agr. eng. dept., California State Polytechnic College. (Mail) 255 Santa Lucia Dr., San Luis Obispo, Calif. (Affiliate to Associate Member)

Schaubert, Darwin J. — Owner-operator of grain farm. (Mail) Bowdon, N. D. (Affiliate to Associate Member)

Spence, John M. Jr. — Rural service engr., Alabama Power Co., Tuscaloosa, Ala. (Associate Member to Member)

Stackhouse, John — Farm mgr., Humphrey Farm, R.R. 2, Wakeman, Ohio (Affiliate to Associate Member)

Wilson, Thomas V. —Prof., agr. eng. dept., Clemson College, Clemson, S. C. (Associate Member to Member)

STUDENT MEMBER TRANSFERS

Asmus, Rodger W. — (Ohio State University) (Mail) 1633 Dearing Rd., Memphis, Tenn.

Crolley, William Grant — (Texas A and M) (SCS) USDA. (Mail) 123 E. Mesquite, Uvalde, Tex.

. . . Events Calendar

(Continued from page 37)

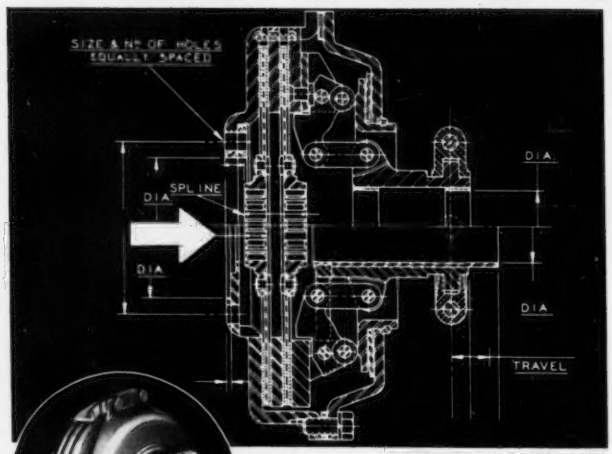
International Confederation of Agricultural Engineers and Technicians. For details contact The CITA Secretary's office, (1st World Congress of Agricultural Research), Beethovenstrasse 24, Zurich, Switzerland.

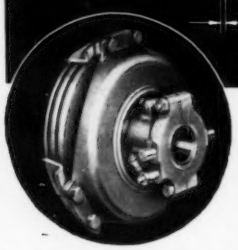
May 18-20 — *Fifth Annual Symposium on Instrumental Methods of Analysis,* Shamrock-Hilton Hotel, Houston, Texas. Apply to Instrument Society of America, 313 Sixth Ave., Pittsburgh 22, Pa.

May 29 - June 7, 1959 — *RiLa* arranged by Swedish Federation of County Agricultural Societies and billed to be the largest agricultural show to be held in Sweden since 1946. Its aim is to give presentation of Sweden's mechanized farming and high-quality livestock breeding, and also the country's agriculture as an export-import industry. Further details may be obtained from The Swedish-International Press Bureau, Brunkebergstorg 14, Stockholm, Sweden.

June 9-13—*Second Inter American Food Congress,* Carillon Hotel, Miami Beach, Fla. For more information write Inter American Food Institute, 1015 Metropolitan Bank Bldg., Miami, Fla.

ROCKFORD





DUAL DRIVE CLUTCH

Starts and Stops the PTO While Tractor Is On the Go

These Over-Center, Spring-Loaded clutches—when used in farm tractor LIVE POWER TAKE-OFFS—enable the harvesting unit to be controlled independently of tractor propulsion. No stops, no delays. Avoids tiresome declutching and reclutching of tractor drive. Like having an extra engine on every machine used with the tractor. Adapted for many other uses—with single, double or triple plates. But one of many types and sizes of ROCKFORD friction CLUTCHES that have been designed and built to meet specific needs. If you have a special power transmission control problem, ROCKFORD clutch engineers will be glad to help you solve it.

Small Spring Loaded

Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

SEND FOR THIS HANDY BULLETIN
Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

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VARIABLE * RATIO STEERING

**Originated and developed by . . .*

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Faster steering and quicker recovery for cornering . . . **slower** steering and greater stability for straight-ahead handling! These are the twin benefits of **variable-ratio** steering, originated and developed by Ross. Steering specialists since 1906, Ross provides the right gear for every steering need—manual or power, constant or variable ratio. Ross invites *your* steering inquiry.

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Variable ratio 12:20:12 . . . 12 to 1 ratio for cornering and 20 to 1 for straight ahead handling . . . 3 turns of wheel from lock to lock.

Constant ratio 22:22:22 . . . 22 to 1 ratio for cornering and 22 to 1 for straight ahead handling . . . 5 turns of wheel from lock to lock.

PERSONNEL SERVICE BULLETIN

NOTE: In this bulletin, the following listings current and previously reported are not repeated in detail; for further information see the issue of AGRICULTURAL ENGINEERING indicated. "Agricultural Engineer" as used in these listings is not intended to imply any specific level of proficiency or registration as a professional engineer. Items published herein are summaries of mimeographed listings carried in the Personnel Service, copies of which will be furnished on request. To be listed in this Bulletin, request form for Personnel Service listing.

POSITIONS OPEN — AUGUST — O-276-830. SEPTEMBER—O-308-831. OCTOBER—O-321-832. NOVEMBER — O-330-834, 331-835, 340--836, 343-837, 344-838. DECEMBER O-352-839, 353-840, 349-841, 349-842, 356-843, 362-844.

POSITIONS WANTED — AUGUST — W-258-38, 236-39, 260-40, 261-41, 242-42, 271-43, 286-44, 285-45, 287-46. SEPTEMBER—W-279-47, 297-48, 248-50. OCTOBER—W-314-52, 315-53. NOVEMBER—W-332-55, 324-56, 339-59, 318-60. DECEMBER—W-347-61, 345-62, 346-63, 358-64, 363-65, 364-66.

NEW POSITIONS OPEN

AGRICULTURAL ENGINEERS for new graduate fellowships for work toward MS and/or PhD in agricultural engineering in a southern university. Candidates may choose work in either power and machinery or soil and water field. Must have BSAE by July 1959. B average required. Excellent summer employment possibilities. Married student housing $35 per month and up. Tuition and fees $150 per year. Deadline for applications February 15, 1959. Apply by letter of intent, supported by transcript of credits and two letters of recommendation. Financial support $2,000 first year, $2,200 second year, $2,400 third year, plus $400 for each dependent. O-418-845

NEW POSITIONS WANTED

AGRICULTURAL ENGINEER for design, development, research or teaching in soil and water field, preferably irrigation and drainage, with college or manufacturer in USA or South America. Single. Age 27. No disability. BSAE, 1954, National Taiwan University. MSAE, 1957, Michigan State University. Ph.D. expected in 1959, Michigan State University. Research experience on sprinkler hydraulics as graduate assistant, 1955 to present. Available July or September 1959. Salary $6,000-$7,000. W-355-67

AGRICULTURAL ENGINEER for design, development, or research in farm structures or product processing, with industry or public service, anywhere in USA. Single. Age 47. No disability. BSME, 1933, Kiev Polytechnic Institute. MA, (Geodetic Surveying) 1957, Asia Institute (Teheran, Iran). MSAE expected February 1959, University of Massachusetts. Construction supervision and route surveying, Iran, 12 years. Mechanical engineer, Trans-Iranian Railroad, 5 years. Construction project engineer, Near East Foundation, 4 years. Graduate assistant instructor 2 years. Available March 15, 1959. Salary open. W-383-68

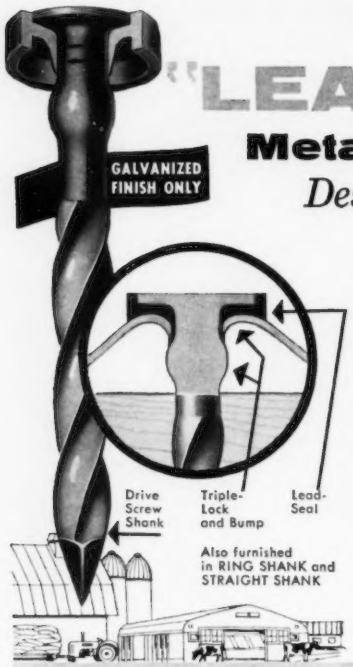
AGRICULTURAL ENGINEER for extension, sales, service, or management in power and machinery with industry or public service, preferably in central U.S. Willing to travel. Married. Age 29. No disability. Graduated Istanbul Agricultural School, 1958. BSA (mechanized agriculture) 1956, University of Tennessee; MSAE, 1957, University of Maryland. Assistant county agent for department of agriculture in Turkey, 4 years. Commissioned service in Turkish Army. Available now. Salary $6,000. W-411-69

AGRICULTURAL ENGINEER for design, development, or research in power and machinery with manufacturer, anywhere in USA. Also open to consider foreign location. Single. Age 28. Vision corrected with glasses. BSAE, 1952. Farm background. Experience in design and development 3 years. Military service 3 years. Available on reasonable notice. Salary open. W-412-70

AGRICULTURAL ENGINEER for sales, service, or management in power and machinery or soil and water field with industry or public service. Any location, Midwest preferred. Reasonable amount of travel. Married. Age 49. No disability. BSAE, 1933, Univ. of Nebraska. Farm background. Soil erosion control and related experience 22 years. Available on 10 days notice. Salary open. W-406-71

AGRICULTURAL ENGINEER for design, development, or research in power and machinery or product processing, with industry or public service. Midwest, West or foreign location. Reasonable amount of travel. Single. Age 24. Subject to asthma. BSAE, 1957, Kansas State College. Farm background, including full time farming past two years. Engineering work in industry 6 months. Available July 1. W-419-72

AGRICULTURAL ENGINEER for development, research sales or service in farm structures, farm machinery, crop processing or soil and water field with industry or public service, anywhere in USA. Married. Age 24. No disability. BSAE expected January 1959, Louisiana State University. Farm background. Available February 1. W-422-73



DENISTON "LEAD-SEAL" Metal Roofing Nails

Designed to a Special Job

No one type of nail is good for all types of duty. That's why DENISTON designed a nail especially for use in applying metal roofing. One that would give a seal through which no moisture can penetrate.

DENISTON "Lead-Seal" galvanized metal roofing nails have proven their efficiency because of these advantages—"lead-seal", triple-lock, drive screw shank and heavily zinc-coated for protection against rust. With this combination you get a nail that will easily last the lifetime of a roof. To insure superior quality, DENISTON "Lead-Seal" nails are now available in galvanized finish only.

All DENISTON nails are shipped in 50 lb., 3-ply corrugated colorboard cartons. Descriptive literature will be sent immediately upon request.

DENCO Lead-Head Metal Roofing Nails

6,000 pounds of pressure is used to compress the lead *cold*, both *over* and *under* the steel head of the nail as well as *down the shank*. This insures a tight head that is impossible to knock off when driving the nail. In addition, the lead forms a perfect seal in the hole made by the nail. The heads will not "pop" off from the expansion and contraction of the metal roofing nor from wind vibration.

Bright or Galvanized Finish

32 Years of Quality Nails

THE DENISTON COMPANY

4876 South Western Avenue • Chicago 9, Illinois

IN CANADA: EASTERN STEEL PRODUCTS CO., LTD., PRESTON, ONTARIO

DENISTON Lead-head ROOFING NAILS TRADE MARK

. . . Research Notes

(Continued from page 42)

"Flight-Bar" Cotton Gin Looks Promising

Six times the capacity of a conventional roller cotton gin stand has been reported for a "flight-bar" roller gin after preliminary tests at USDA's Southwestern Cotton Gin Research Laboratory at Mesilla Park, New Mexico.

James M. Williams, Jr., of the Agricultural Engineering Research Division there, notes that the main factors for favorable capacity of the gin appear to be the possibility of operating the roller at a relatively high peripheral velocity, and the "preginning action" of the flight bars as they approach the stationary knife, which has a slower linear velocity than the peripheral velocity of the roller.

Objectives are a roller-type gin of simple construction, high capacity per unit length of the roller, lower power requirements, and high efficiency of separation of seed from lint, quality of lint, and little seed damage.

IF you have ever watched your child at play—secure, happy, unafraid—you have seen the strongest argument in the world for investing part of every pay in United States Savings Bonds. For bonds, which can protect her present and insure her future, are savings you cannot lose. They're Government-insured up to any amount. They pay 3¼% interest when held to maturity. And they make saving for security easier—because you can buy them automatically through the Payroll Savings Plan where you work. Or regularly where you bank. Why not start your bond program today? Make life more secure for someone you love.

AGRICULTURAL ENGINEERING

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PROMPTEST MAN ON WHEELS

He's the punctual ELECTRIC man. Call him for the quickest answers and the fastest follow-through on wheels.

Whether you're putting wheels on a new product or improving an old one, you want production schedules and prices while you're planning. That's why ELECTRIC sales engineers work with you on the job.

Call one in on your next problem. See what a seasoned man, backed by the capacities and capabilities of an automated operation and years of agricultural and industrial experience, can do for you.

Call or write today for whatever you want in a disc or spoke-type wheel (steel or rubber tired), rim, hub, axle or component part.

"What we sell is service"

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Write to Department 1A,
1120 N. 28th St., Quincy, Illinois, BAldwin 2-5320

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Advertising Manager: RAYMOND OLNEY, 420 Main St., St. Joseph, Mich. YUkon 3-2700

. . . Members in the News

(Continued from page 40)

Charles W. Davis has been transferred from his position as service supervisor, Florida Ford Tractor Co. to Lyons, Georgia, where he will have charge of the Ford Tractor agency in that city.

Deane G. Carter, emeritus professor of agricultural engineering, University of Illinois, has been named by the American Society for Engineering Education as one of six experts in engineering teaching to study plans for a new engineering school at Kanpur, India. The mission was formed at the request of the Indian Ministry of Scientific Research and Cultural Affairs. Upon their return to America, members of the mission will collaborate with expert consultants on specific plans for buildings, laboratories, budgets, and operation at the proposed institution.

J. Irwin Davis, who retired in August 1958 from Caterpillar Tractor Co. after 29 years with the organization, has accepted an appointment with the Rome Plow Co. as a consultant. He is located at Cedartown, Ga.

Robert H. Brown, associate professor of agricultural engineering, University of Georgia, has completed requirements for a Ph.D. degree from Cornell University as recipient of a Danforth Teacher Study Grant. His thesis topic was "An Investigation of Electrical and Electronic Means of Measuring Liquid Flow in Milk Lines." He received a B.S. degree in electrical engineering from Emory University in 1939 and a B.S. degree in agricultural engineering from the University of Georgia in 1940. In 1948 he earned an M.S. degree in education.

Dr. Brown is chairman of the Student Paper Awards for the Southeastern Section of ASAE and faculty advisor of the Georgia Student Branch of ASAE. He is author of the textbook "Farm Electrification" published in 1956 by McGraw-Hill Book Co.

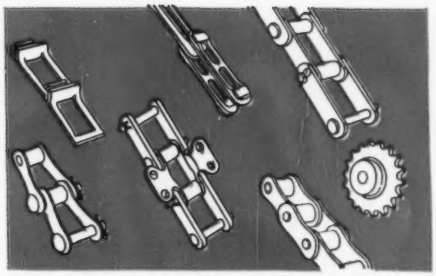
J. H. Strickler, former coordinator for the Virginia Farm & Home Electrification Council returned to Virginia Polytechnic Institute October 1 to become associate extension agricultural engineer. He is on a temporary appointment replacing **A. J. Lambert** who is at Michigan State University taking graduate work.

Alton W. Almquist, formerly employed by the United States Department of the Interior, Bureau of Indian Affairs, has accepted employment with the United States Department of Agriculture, Soil Conservation Service. He is working on the Walnut Creek Watershed Project with headquarters at Concord, Calif.

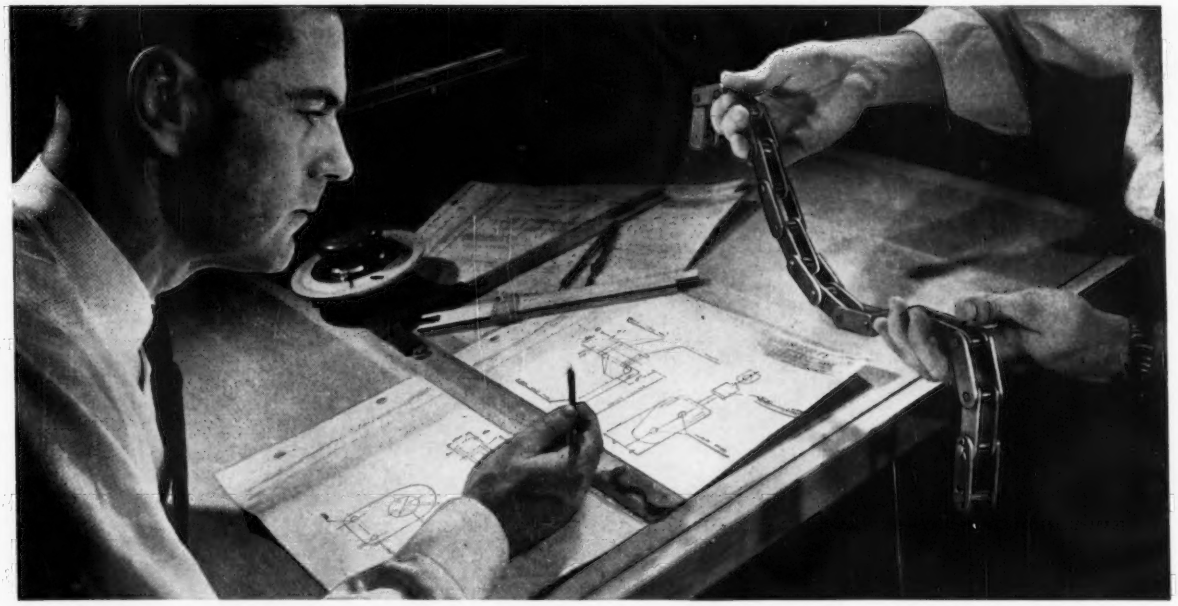
J. C. Webb has been transferred from Agricultural Research Service, United States Department of Agriculture at Beltsville, Md., to the Tennessee Agricultural Experiment Station at Knoxville where he will assist R. B. Stone in electrical seed treatment studies. While at Beltsville he conducted research on the effects on swine of sound from jet planes.

Only from LINK-BELT— the best in chain and these

bonus services besides



1. **APPLICATION COUNSEL** — With the experience gained in developing industry's most complete chain line, Link-Belt can give you unbiased advice as to the right chain and sprocket for your machine.

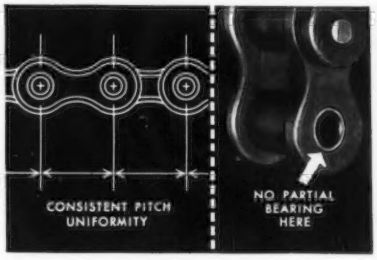


2. **EXPERIMENTAL CHAINS AND ATTACHMENTS** — If you have requirements that can't be met by standard chains and attachments, Link-Belt will work with you on the drawing board and in field tests to provide tailor-made answers to your problems.

3. **FIELD ANALYSIS** — Link-Belt engineers are constantly working with equipment manufacturers in field tests. By careful study of chain performance under actual working conditions, they can interpret needs and make correct recommendations.

4. **LABORATORY SERVICE** — Every Link-Belt chain meets rigid uniformity specifications. And our laboratory, located at the world's largest plant manufacturing drive and conveyor chains, continuously seeks new ways to increase chain life.

5. **BETTER DESIGN AND MANUFACTURE** — Precision manufacture and close processing control assure consistent quality and unvarying pitch uniformity in every link, every time. Also, consistency of press fits adds to life of all Link-Belt roller chain. Lock-type bushings, which end a cause of stiff chain, are typical of design bonuses.



For facts on Link-Belt's complete line of chains, sprockets and attachments, contact your nearest Link-Belt office.

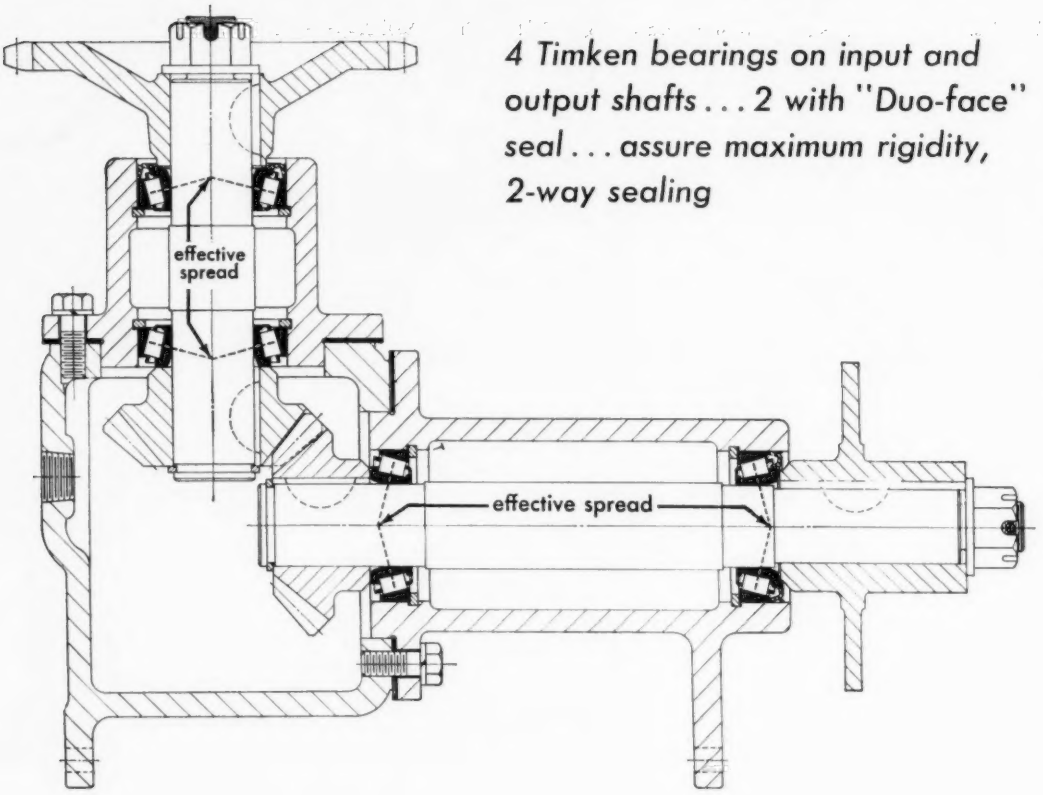
LINK-BELT

THE SYMBOL OF QUALITY

CHAINS AND SPROCKETS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 14,900

John Deere cuts gear case cost, gets more compact design with TIMKEN® bearings



4 Timken bearings on input and output shafts . . . 2 with "Duo-face" seal . . . assure maximum rigidity, 2-way sealing

WITH the new, standardized-size Timken® tapered roller bearings, made by high-speed mechanization, John Deere engineers simplified design and cut costs of their No. 50 Sheller gear case. They mounted the input and output shafts on 4 of the new design "green light" high production Timken bearings made at our Bucyrus plant. Two have the exclusive new Timken "Duo-face" seal.

These new Timken bearings are lighter, smaller, yet capacity-packed. By saving space, they permitted more compact design. And they reduced gear case cost because they eliminated extra machining—finishing, turning and polishing—for the seal seats.

Using indirect bearing mountings, the engineers could take advantage of the effective spread principle of Timken bearings (see above). The effective spread and full-line contact between Timken bearing rollers and races give maximum stability, keep gears and shafts rigidly aligned. The new "Duo-face" seal gives positive, 2-way sealing. And it cuts installation costs because bearing and seal are pre-assembled.

More and more farm equipment manufacturers are switching to Timken bearings to simplify designs and cut costs. Their tapered construction lets Timken bearings take *both* radial and thrust loads. Their true rolling motion practically eliminates friction, saves power and fuel. And because they hold shafts concentric with housings, Timken bearings make closures more effective. Dirt stays out, lubricant in. Farmers get better performance with less maintenance.

Timken bearings solve three big problems for agricultural engineers: 1) Combination loads; 2) dirt; 3) ease of operation. Why not standardize on "green light" Timken bearings? For expert help in designing new bearing applications, call our Sales Engineers. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO". *Makers of tapered roller bearings, fine alloy steels and removable rock bits.*

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭
BEARING TAKES RADIAL ▯ AND THRUST ▯ LOADS OR ANY COMBINATION ▯

The farmer's assurance of better design

Tapered Roller
TIMKEN BEARING
EQUIPPED